



USAID
FROM THE AMERICAN PEOPLE



The State of the Sea: Indonesia



Volume Three

A Journey Through Eastern Indonesia:
USAID SEA Project – Sites and Activities

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Volume Three

A Journey Through

Eastern Indonesia:

USAID SEA Project —

Sites and Activities

Produced by the USAID Sustainable Ecosystems
Advanced (SEA) Project and the Ministry of Marine
Affairs and Fisheries (MMAF), Republic of Indonesia



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This publication was jointly produced by the USAID Sustainable Ecosystems Advanced (SEA) Project and the Ministry of Marine Affairs and Fisheries (MMAF), Republic of Indonesia.

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Front cover photo: fisher at sea off the coast of Morotai Island, North Maluku. T Schultz

Back cover photo: fish catch. Coral Triangle Center / M Korebima

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ABBREVIATIONS & ACRONYMS

APMS	<i>Agen Premium dan Minyak Solar</i> (Premium fuel and diesel agent)	MPA	Marine protected area
BASARNAS	<i>Badan Search and Rescue Nasional</i> (National Search and Rescue Agency)	MSP	Marine spatial planning
BHS	Bird's Head Seascape	nm	Nautical miles
BPS	<i>Badan Pusat Statistik</i> (Central Bureau of Statistics)	NTZ	No-take zone
CoC	Chain of custody	PerMen	<i>Peraturan Menteri</i> (Ministerial regulation)
CPUE	Catch per unit effort	PES	Payment for ecosystem services
CTC	Coral Triangle Center	PIT	Point intercept transect
EAFM	Ecosystem-based approach to fisheries management	Pokmaswas	<i>Kelompok masyarakat pengawas</i> (Community surveillance group)
E–KKP3K	<i>Pedoman teknis evaluasi efektivitas pengelolaan kawasan konservasi perairan, pesisir dan pulau-pulau kecil</i> (Technical guidelines for evaluating the management effectiveness of aquatic coasts and small island conservation areas)	PPI	<i>Pangkalan pendaratan ikan</i> (Fishing landing base)
ERR	Economic rate of return	PPN	<i>Pelabuhan perikanan nusantara</i> (National fishery port)
ETP	Endangered, threatened, and protected	PT	<i>Perseroan terbatas</i> (Limited company)
FAD	Fish aggregation devices	PTSP	<i>Pelayanan terpadu satu pintu</i> (One-stop integrated service)
FMA	Fisheries management area	RZWP-3-K	<i>Rencana zonasi wilayah pesisir dan pulau-pulau kecil</i> (Marine spatial planning for coastal and small islands)
FT	Fair Trade	SEA	Sustainable Ecosystems Advanced
GT	Gross tons	SIMKADA	<i>Sistem informasi izin kapal daerah</i> (Licensing information system)
ha	Hectare	SKA	<i>Surat keterangan asal</i> (Certificate of origin)
HP	Horsepower	SKPT	<i>Sentra Kelautan dan Perikanan Terpadu</i> (Center for Integrated Marine and Fisheries)
IDR	Indonesian Rupiah	SME	Small and medium enterprise
Ind	Individuals	SOP	Standard operating procedure
I-FISH	Indonesian Fishery Information System	SPAG	Spawning aggregation
KEK	<i>Kawasan ekonomi khusus</i> (Special economic zone)	SPDN	<i>Solar Package Dealer Nelayan</i> (Government-sponsored fuel provisions)
kg	Kilogram	SSIC	Sustainable Solutions International Consulting
KPA	<i>Kawasan perikanan adat</i> (Customary fishery area)	SUMALI	Sula, Mangoli, and Lifmatola
KUB	<i>Kelompok usaha bersama</i> (Joint business group)	TURFS	Territorial use rights for fisheries
LMMA	Locally-Managed Marine Area	TWP	<i>Taman Wisata Perairan</i> (Marine Tourism Park)
MCA	Marine conservation agreement	UNIPA	Universitas Negeri Papua
MEF	Ministry of Environment and Forestry	USA	United States of America
MMAF	Ministry of Marine Affairs and Fisheries	USAID	United States Agency for International Development
		USD	United States Dollar

USG	United States Government
UU	<i>Undang-Undang</i> (Act)
UVC	Underwater visual census
WCS	Wildlife Conservation Society
WWII	World War Two

Below: mangrove and *casuarina* species line the coast in Tujuh Island, Maluku



ABOUT THE USAID SUSTAINABLE ECOSYSTEMS ADVANCED (SEA) PROJECT

On March 21, 2016, Tetra Tech was awarded the USAID SEA Project by the USAID Indonesia Mission. This is a five-year initiative that supports the Government of Indonesia to improve the governance of fisheries and marine resources and to conserve biological diversity at local, district, provincial, and national levels. The USAID SEA Project is focusing its interventions in the North Maluku, Maluku, and West Papua provinces, located in fisheries management area (FMA) number 715.

The objectives of the USAID SEA Project are to:

- support enhanced conservation and sustainable use of marine resources by reforming fishery management and promoting marine protected areas (MPAs) to enhance fishery productivity, food security, and sustainable livelihoods within the target areas
- support and strengthen the leadership role and capacity of the MMAF and local governments to promote conservation and sustainable fishing.

At the end of five years, USAID assistance through the USAID SEA Project will have improved the conservation and management of Indonesia’s marine biodiversity through increased capacity and the application of marine conservation and sustainable fisheries management.

The high-level results that must be achieved by the completion of the project are as follows:

- at least six million hectares in the targeted FMA are under improved fisheries management as a result of United States Government (USG) assistance
- at least six policies, laws, regulations, and/or operational protocols in support of marine conservation and sustainable fishery management created, strengthened, promulgated, and/or enforced at all levels
- key drivers and highest-rated pressures to marine biodiversity show a declining trend in the target areas.

The technical approaches of the USAID SEA Project fall under four key categories, supported by wider strategic approaches, each with associated indicators of success.

Implementing an Ecosystem Approach to Fisheries Management	Establishing and Effectively Managing Marine Protected Areas	Supporting Marine Spatial Planning for Sustainable Management	Promoting Law Enforcement
Improving ecosystem management <i>(# hectares showing improved biophysical condition; # fishing vessels registered; % change in CPUE; % change in reef fish biomass)</i>			
Creating Demand Through Awareness Raising and Advocacy <i>(# people demonstrating changed behavior)</i>	Increasing Incentives for Marine Stewardship <i>(# people with increased economic benefits, secure tenure or managed access; amount of investment leveraged)</i>	Advancing the Development of Marine and Fisheries Policies & Regulations <i>(# of laws, policies, strategies, plans or regulations proposed or adopted)</i>	Institutionalizing Training & Capacity Building <i>(# people trained and applying improved law enforcement practices; # innovations supported)</i>

The USAID SEA Project is implemented through the MMAF, with technical support from Tetra Tech and funding from USAID Indonesia.



Below: coastal environment in Sula, North Maluku

The **Ministry of Marine Affairs and Fisheries (MMAF)** of the Republic of Indonesia was established in 1999. The vision of MMAF is to achieve competitive and sustainable development of fisheries and marine resources for the welfare of the community. To realize this vision, the ministry's mission is to: (1) optimize the utilization of marine resources and fisheries; (2) increase the value and competitiveness of marine and fishery products; and (3) maintain the carrying capacity and environmental quality of marine resources and fisheries (www.kkp.go.id).

The **United States Agency for International Development (USAID)** is a federal agency that manages U.S. foreign assistance throughout the world to help developing countries improve their economic and social conditions. USAID is the lead USG agency that works to end extreme global poverty and enable resilient, democratic societies to realize their potential. Through targeted investment and by harnessing the power of science, technology, and innovation, USAID works with the government of Indonesia, local leaders, academia, the private sector, civil society, and partners to address development challenges, from forging a just and accountable democracy to meeting the needs of the most vulnerable Indonesians (www.usaid.gov).

Tetra Tech is a leading provider of consulting, engineering, and technical services worldwide. In the field of international development, Tetra Tech aims to create practical, sustainable, and environmentally responsible solutions to address the world's most complex challenges. Its service areas include agriculture and economic growth; democracy and governance; energy; environment and natural resources; land tenure and property rights; water supply and sanitation; architecture, engineering, and construction services; and global security. The firm has provided services to support sustainable development throughout Asia for more than 20 years and more than 50 years globally.



IR TARMIDI

IMPLEMENTING PARTNERS & SUB-CONTRACTORS

Asosiasi Perikanan Pole & Line dan Handline Indonesia (AP2HI) is the Indonesian Pole & Line and Handline Fisheries Association. AP2HI supports the long-term implementation of sustainability principles for the pole and line and hand line industries and small-scale fisherman in coastal areas of Indonesia. The association was officially inaugurated by the Director General for Capture Fisheries at the Third International Coastal Tuna Business Forum held in Jakarta in 2014. It aims to unite the aspirations of its members and provide guidance on local and international sustainable tuna fishery issues. AP2HI membership ranges across the entire tuna industry. AP2HI is involved in a range of fisheries improvement projects with various parties and has supported government and local agencies to improve access strategies and certification (www.ap2hi.org).

Conservation International (CI) has been working since 1987 to improve human well-being by caring for nature. CI works to ensure a healthy, productive planet for everyone, because people need nature to thrive. Building upon a strong foundation of science, partnership, and field demonstration, CI empowers societies to act responsibly and sustainably for nature, global biodiversity, and, ultimately, for the well-being of humanity. CI has been working in Indonesia since 1991, supporting conservation efforts to achieve sustainable development goals for the lasting benefit of local people (www.conservation.org).

The Coral Triangle Center (CTC) is a local foundation based in Bali with regional scope and global impact. CTC provides capacity building for sustainable fisheries and works to ensure that MPAs within the Coral Triangle are managed effectively, supporting on-the-ground programs through its learning sites in Nusa Penida and the Banda Islands. CTC leads regional learning networks and is a certified training center of the government of Indonesia. CTC works with communities, businesses, governments, and partners to shape lasting solutions to protect coral reef ecosystems and ensure sustainable livelihoods and food security (www.coraltrianglecenter.org).

Indonesia Locally-Managed Marine Area (ILMMA) Network is part of the international LMMA Network that operates in nine countries across the Indo-Pacific. ILMMA was established in 2002 and is focused on eastern Indonesia. To date, ILMMA collaborates with 200 communities to set up their locally managed marine areas (LMMAs) through traditional *sasi* practices. ILMMA's goal is to assist coastal villages in Papua and Maluku to successfully establish and manage LMMAs, expand the number of independent and sustainable locally-managed marine areas, build a more effective LMMA network, and ensure that marine ecosystems and fisheries are healthy and provide food security for local communities (www.lmmanetwork.org).

Marine Change (PT Konsultasi Investasi Kelautan) is a specialist advisory group founded in 2014. Its vision is to see disciplined long-term investment in innovative efforts to renew fishery and marine ecosystems, permitting them to recover from over-exploitation; ultimately, these efforts will lead to increased prosperity, food security, and secure livelihoods. Marine Change identifies interventions and investment opportunities that lead to improved supply chain efficiency, more sustainable products, and better financial, environmental, and social performance, with increased benefits to coastal communities and seafood companies alike (www.marinechange.com).

The Nature Conservancy (TNC) was established in 1951 and is a well-known organization that works for nature conservation in 72 countries, with a mission to conserve the lands and waters upon which all life depends. In Indonesia, TNC is affiliated with TNC Indonesia, and has supported the conservation of more than 3.9 million hectares (ha) of forest and 5.5 million ha of marine areas in its 26 years in the country. TNC Indonesia aims to ensure future generations inherit a sustainable natural environment (www.nature.or.id).



Rare works through behavior adoption campaigns, known as Pride Campaigns. Rare aims to inspire change to help nature and people thrive. Rare's biggest program is 'Fish Forever'. It encourages fishers to comply with zoning plans and sustainable fishery interventions in exchange for exclusive fishing rights (Territorial Use Rights for Fishing, or TURFs). This strengthens marine tenure, improves fishery sustainability, strengthens communities' organizing capacity, and improves governance of marine resources. Rare's programs improve fisheries, promote more resilient communities, and improve livelihoods and food security. Indonesia is one of five countries selected for implementing Fish Forever (www.rare.org).

Reef Check Foundation Indonesia (RCFI) is part of part of Reef Check International, the largest coral conservation network in the world, spanning over 90 countries. The organization is dedicated to empowering people to improve coastal community welfare through integrated coastal and marine ecosystem management based around three pillars: (1) collaborative management, (2) education–awareness, and (3) science–technology. Reef Check was formed in 1997 as a result of a conservation initiative, through which volunteers were actively involved in monitoring Indonesia's coral reefs. RCFI was founded in 2005 (www.reefcheck.or.id).

Universitas Kristen Papua (UKIP) is a private university established in 2004 and located in Sorong. UKIP has 10 study programs, including fisheries, and 2,000 students. Its vision is to become a center of excellence for higher education in Papua (www.ukip.ac.id).

Universitas Negeri Papua (UNIPA) was established based on Presidential Decree no. 153/2000 and developed by the Faculty of Agriculture, Cenderawasih University. UNIPA has three main tasks: educating, conducting research, and supporting the betterment of society. The university has three campuses, the main one located in Manokwari and the others in Sorong and Raja Ampat. UNIPA has 12 faculties, one of which is the Faculty of Fisheries and Marine Science (www.unipa.ac.id).

The Wildlife Conservation Society (WCS) has worked in Indonesia since the 1960s; in 1995, it opened a country program under a memorandum of understanding with the Ministry of Environment and Forestry. WCS has operated projects in Sumatra, Java, Sulawesi, Nusa Tenggara, and Maluku. In recent years, it has become one of the leading actors in wildlife species conservation and the fight against wildlife crime (www.wcs.org).

World Wildlife Fund – Indonesia (WWF–I) is an independent national conservation organization established in 1962 and member of the WWF global network. Today, WWF–I has 500 staff and works in 28 field areas in 17 provinces, from Aceh to Papua, in collaboration with government, local communities, the private sector, local Non-Governmental Organizations (NGOs) and the general public (www.wwf.or.id).

Yayasan Masyarakat dan Perikanan Indonesia (MDPI) was founded in July 2013 as an independent foundation to promote responsible, sustainable fisheries and the conservation of fishery ecosystems in Indonesia and across the region. These efforts are specifically focused on small-scale, artisanal fisheries. In addition, MDPI supports the development of fishing communities and related supply chains through programs focusing on economic improvements and social stability; the foundation works closely with industries within the supply chains of various seafood products (www.mdpi.or.id).



**Yayasan
Masyarakat dan Perikanan
Indonesia**



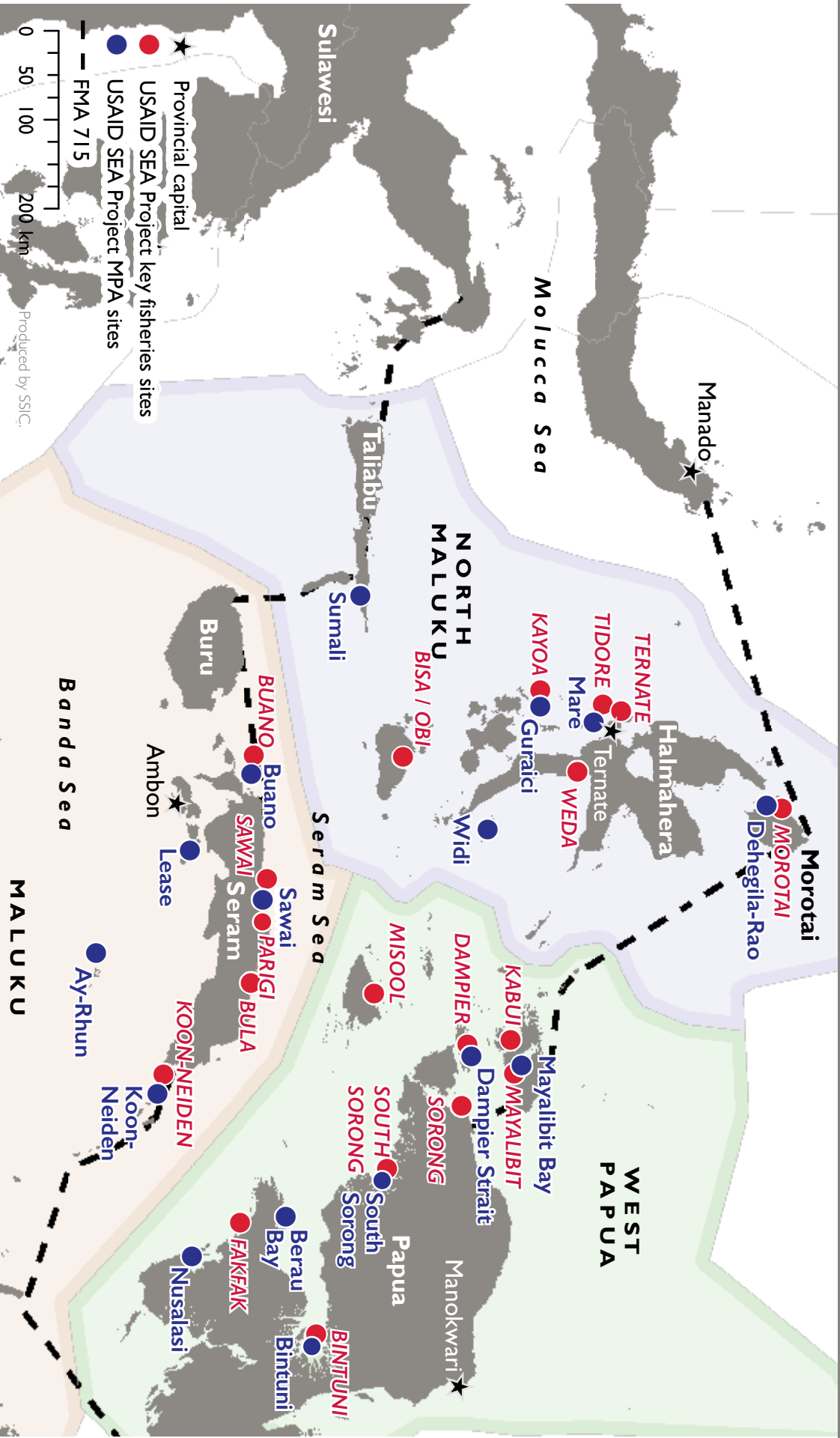
The State of the Sea: Indonesia

Volume Three

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THE PROJECT SITES EXPLORED IN VOLUME THREE



TAKE A JOURNEY

In this book, we journey through the three provinces of **North Maluku, Maluku, and West Papua** to visit coastal communities where proactive marine and coastal management is being implemented.

We see how some of the action frameworks outlined in **volume one** of this publication are being applied in the field. We learn how the process steps to achieve sustainable management, as described in **volume two**, are progressing on the ground.

We travel to some of the remotest areas of Indonesia to the sites supported through the USAID SEA Project and discover what has been learned to date about the marine environment, the fisheries, and the people of these regions. We share the challenges and unearth the opportunities being leveraged to sustain the marine environments of these areas and support small-scale fisheries today and into the future.

This book is presented as a catalogue of information. It provides a thorough insight into the current conditions on the ground at each of the sites as well as a yardstick for measuring change in the coming years.



Below: journeying through remote West Papua

CI / M A ERDMANN



HOW TO USE THIS BOOK

This book has three chapters – one for each province:

Chapter One: North Maluku

Chapter Two: Maluku

Chapter Three: West Papua

Within each of these chapters, we journey to the sites being supported by the USAID SEA Project.

At sites where marine protected areas are being established and supported to become effectively managed, a summary checklist is appended to the narrative that shows the key areas of work that will be undertaken by 2021 (appearing like the example here).

[illegible]

learn more about what each of these steps entails:
see volume two, chapter three

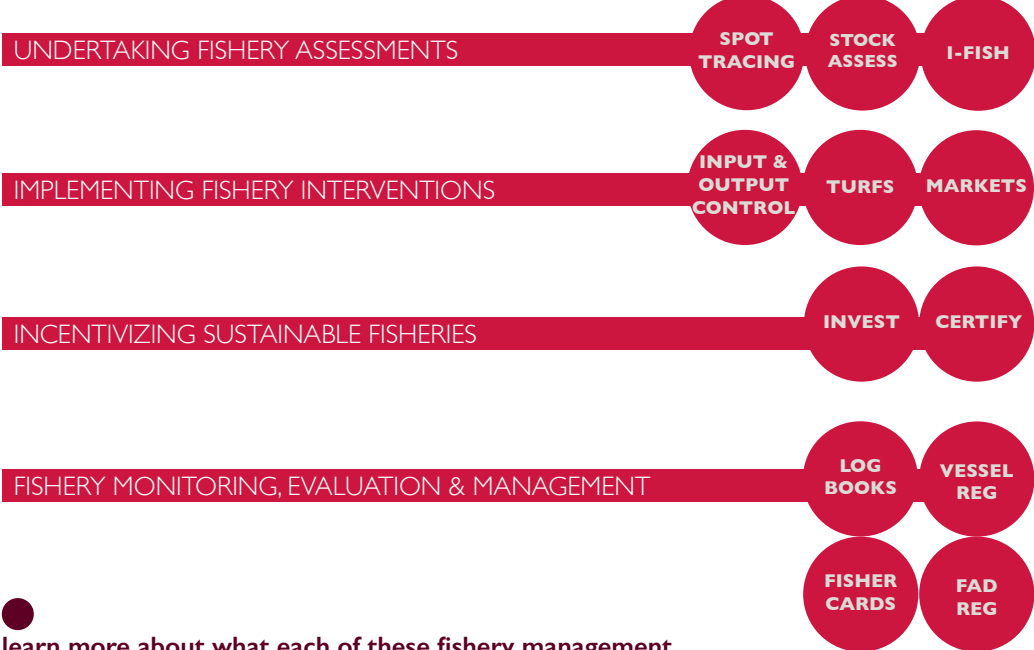
Below: coral reef in Maluku

Right: tuna is an important fishery commodity in eastern Indonesia



Where wider sustainable fisheries work is being supported, a summary of the key actions being implemented is given at the end of each site-based narrative (appearing like the example here) accompanied by a short descriptive text.

USAID SEA PROJECT SUPPORT



● learn more about what each of these fishery management activities involve: see volume two, chapter four



WWF / E FIRMANSYAH



COMMON TARGET FISHERY SPECIES IN NORTH MALUKU, MALUKU AND WEST PAPUA

Ironjaw snapper (*Aphareus rutilans*)



KANNAN K AND SURESHKUMAR K

Source: Fishbase CC-BY

Freckled hind (*Cephalopholis microprion*)



JEFFREY T. WILLIAMS / SMITHSONIAN INSTITUTION

Source: fishesofaustralia.net CC-BY Attribution-Non-Commercial-ShareAlike

Tomato hind (*Cephalopholis sonnerati*)



THOMAS GLOERFELT-TARP

Deepwater red snapper (*Etelis carbunculus*)



THOMAS GLOERFELT-TARP

Deepwater longtail red snapper (*Etelis coruscans*)



MCZ / HARVARD UNIVERSITY

Source: fishesofaustralia.net CC-BY Attribution-Non-Commercial-ShareAlike

Two-spot red snapper (*Lutjanus bohar*)



THOMAS GLOERFELT-TARP

Crimson snapper (*Lutjanus erythropterus*)



THOMAS GLOERFELT-TARP

Humpback red snapper (*Lutjanus gibbus*)



THOMAS GLOERFELT-TARP

Malabar blood snapper (*Lutjanus malabaricus*)



THOMAS GLOERFELT-TARP

Bullet tuna (*Auxis rochei*)



Source: Fishbase CC-BY

SAHAT RATMUANGKHWANG

Mackerel scad (*Decapterus macarellus*)



THOMAS GLOERFELT-TARP

Lutke's halfbeak (*Hemiramphus lutkei*)



JOHN E. RANDALL

Indian mackerel (*Rastrelliger kanagurta*)



SAHAT RATMUANGKHWANG

Source: Fishbase CC-BY

Mackerel tuna (*Euthynnus affinis*)



JOHN E. RANDALL

Banana shrimp (*Penaeus merguensis*)



WWF

Skipjack tuna (*Katsuwonus pelamis*)



DEPOSITPHOTOS.COM

Giant tiger prawn (*Penaeus monodon*)



WWF

Yellowfin tuna (*Thunnus albacares*)



PASCAGOULA LABORATORY; COLLECTION OF BRANDI NOBLE, NOAA/NMFS/SEFSC
Source: fishesofaustralia.net license: public domain

Orange mud crab (*Scylla olivacea*)



DEPOSITPHOTOS.COM

COMMON GEAR TYPES IN SMALL-SCALE COASTAL FISHERIES:

GILL NETS



DRIFT GILL NET



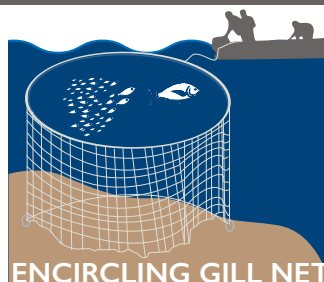
HP boat paddles – 15



SET GILL NET



HP boat paddles – 40



ENCIRCLING GILL NET



HP boat paddles – 40

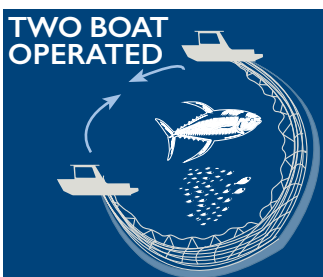
SURROUNDING NETS



WITH PURSE LINE



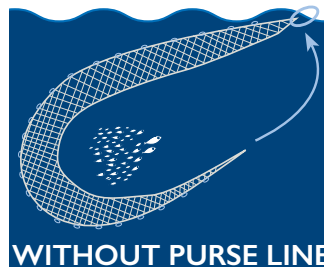
HP boat paddles – 160



TWO BOAT OPERATED



HP 80+

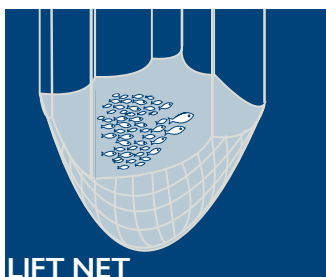


WITHOUT PURSE LINE



HP boat paddles – 40

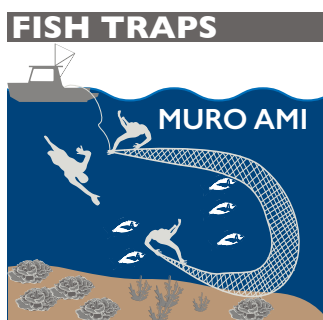
LIFT NETS



LIFT NET



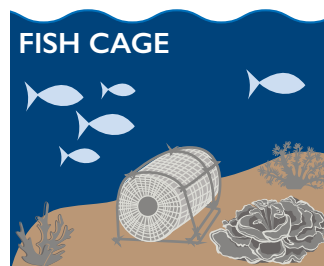
HP 13-40



MURO AMI



HP boat paddles – 40



FISH CAGE

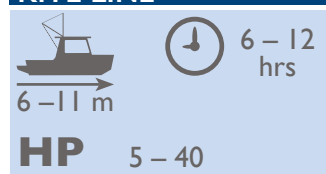
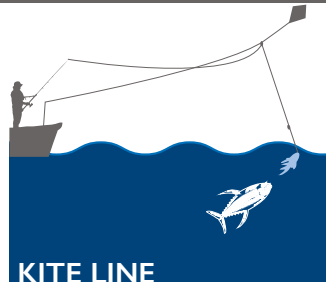
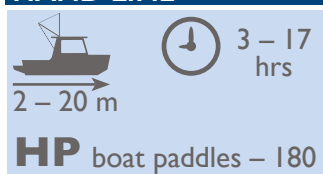
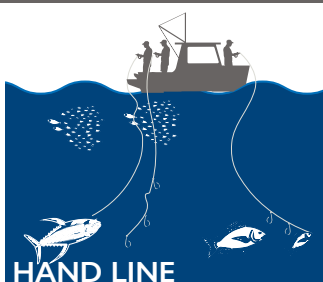
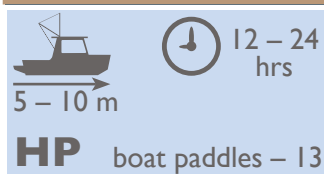
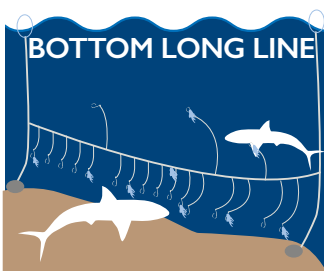


HP boat paddles – 15

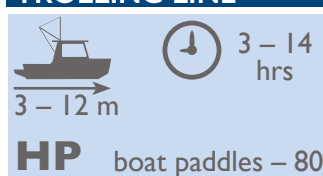
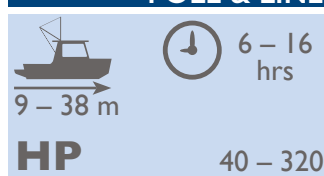
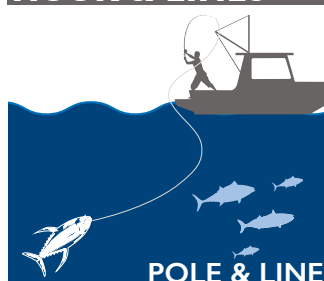
Gear specifications. Gill nets: encircling (100 - 300m long x 5 - 15m wide. Mesh 1 - 3.5 inches); drift (50 - 200m long x 3 - 5m wide. Mesh 1.5 - 3.5 inches); set (50 - 300m long x 3 - 5m wide. Mesh 1 - 3.5 inches). Lift nets: 15 x 15m nets, 9 - 30m depth. Surrounding nets: with purse line (200 - 300m long x 9 - 40m wide. Mesh 1.5 to 2 inches); two boat operated (200 - 300m long x 60m wide); without purse line (100 - 200m long x 5 - 10m wide). Fish cage: 100 cm long x 50 cm wide.

NORTH MALUKU, MALUKU AND WEST PAPUA

HOOK & LINES



HOOK & LINES



KEY

Ranges (min – max)

Vessel size
(meters)



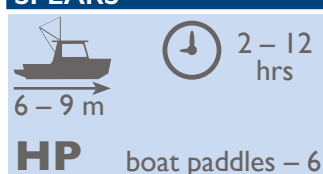
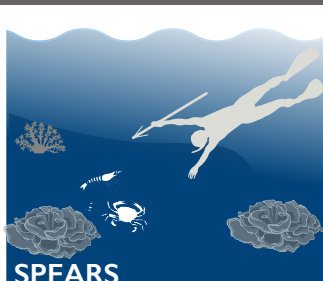
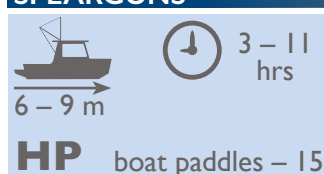
Engine size
(HP)

HP

Trip duration
(hours)



SPEARS



TARGET FISH

Small pelagic



Large pelagic



Demersal



Non-fish
species



Shark



Sources: Inayah and Darmono, 2017; Irwanto *et al.*, 2017e; Ishak and Herdiana, 2017; Ihsan *et al.*, 2018; Jakub, 2017c; Kochen, 2017; Kushardanto *et al.*, 2017a; Lestari, 2017; MDPI, 2017; Mandagi, 2017b; Mustofa *et al.*, 2017; Muttagin *et al.*, 2017; Retnoningtyas *et al.*, 2017; Sasi *et al.*, 2017; Timur, 2017; Welly *et al.*, 2012; Welly *et al.*, 2017b; Welly *et al.*, 2017c; Wisesa *et al.*, 2016a; Wisesa *et al.*, 2016b; Yusuf *et al.*, 2017. Produced by SSIC.



CHAPTER I

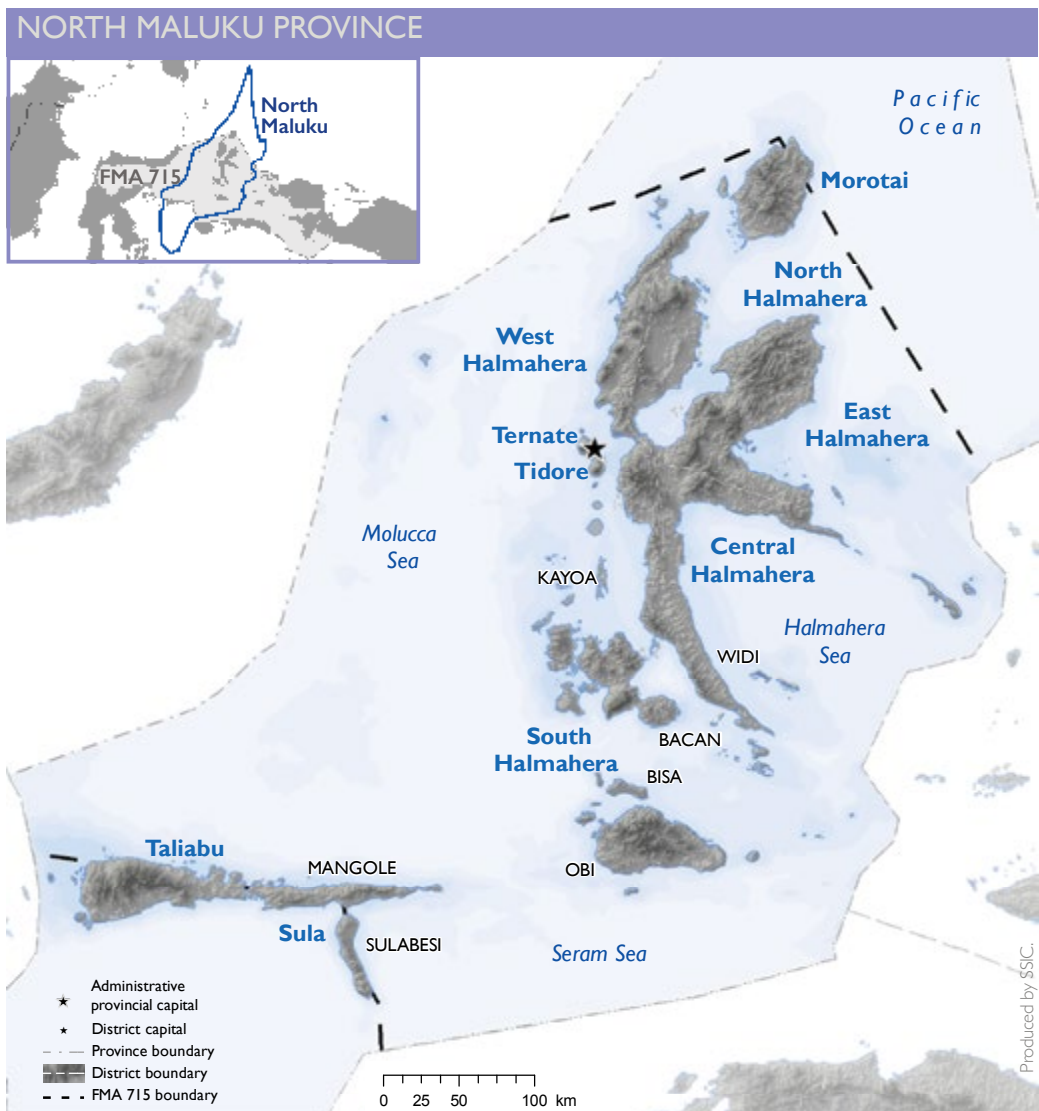
NORTH MALUKU





North Maluku is host to exceptional biodiversity, with many endemic species and a shoreline boasting ancient coral colonies believed to be more than 1,000 years old.

The province of North Maluku (*Maluku Utara provinsi*) is located in the northern region of the Molucca Islands. It consists of nearly 400 islands, only 70 of which are populated. The largest island is Halmahera, covering an area of 17,780 km². Other major islands are Morotai, Obi, Bacan, and the main islands of the Sula archipelago (Taliabu, Mangole, and Sulabesi) (Gorlinski, 2014).





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The province meets Indonesia's national boundary to the north, where it intersects with the Pacific Ocean. It is flanked by the Halmahera Sea to the east, the Seram Sea to the south, and the Molucca Sea to the west, where deep underwater trenches can be found (up to 4,800 m) (BPS Provinsi Maluku Utara, 2016).

Administratively, the province of North Maluku was established in 1999, when the former region of the Maluku Islands was split in two (North Maluku and Maluku). The area is divided into eight districts / regencies (*kabupaten*) (West Halmahera, Central Halmahera, the Sula Islands, South Halmahera, North Halmahera, East Halmahera, Morotai Island, and Taliabu Island) and two cities / municipalities (*kota*) (Ternate and Tidore). These are further sub-divided into 115 districts (*kecamatan*) and 1,181 villages (*desa*) (BPS Provinsi Maluku Utara, 2016). The provincial capital is officially Sofifi in central Halmahera; however, since the turn of the century, provincial administration has operated out of Ternate.

The landscape of North Maluku is predominantly of volcanic origin, with five volcanoes still active in the area, the tallest of which is Mount Gamalama in Ternate, with an elevation of 1,715 m (BPS Provinsi Maluku Utara, 2016; Wikipedia, 2018). Due to its rich volcanic soil and its tropical climate, the region's terrestrial habitat is dominated by dipterocarp rainforest. Located in an area known as the Wallacea transition zone, the province is host to exceptional biodiversity, with many endemic species. This includes the masked flying fox (*Pteropus personatus*), the Obi mosaic-tailed rat (*Melomys obiensis*), and a range of arboreal marsupials (*Phalanger ornatus*, *P. rothschildi* and *P. matabiru*), including the endangered Gebe cuscuses (*P. alexandrae*) (Wikramanayake et al., 2001).

There are over two hundred different bird species on the islands, twenty-six of which are endemic, including the elusive invisible rail (*Habroptila wallacii*) and Wallace's standardwing (*Semioptera wallacii*). The islands are also home to the nation's highest concentration of coconut crabs (*Birgus latro*) as well as the largest bee in the world (the vulnerable Wallace's giant bee –

NORTH MALUKU AT A GLANCE

TOTAL AREA

140,255 km²



MARINE AREA

106,977 km²

(76% of total)

POPULATION

~1,162,300



51%



49%

COASTAL

POPULATION

~53% *



KEY RELIGIONS

Islam 74%

Protestant 25%

Catholic <1%



KEY LANGUAGES

Indonesian, Ternate

TIME ZONE

UTC+9



ADMINISTRATION

8 districts / regencies, 2

cities, 115 sub-districts,

1,181 villages



Page 8: fishing boat and trap,
North Maluku

Previous page, left: fisherman in
Morotai, North Maluku

Previous page, right: North
Maluku waters support abundant
microfauna

Above, left: village in Sula Islands,
North Maluku

Above, right: saltwater crocodile



DEPOSITPHOTOS

Megachile pluto) (Huffard et al., 2012; Wikramanayake et al., 2001). The region also hosts the world's largest populations of crocodiles (*Crocodylus porosus* and *C. novaeguineae*) (Huffard et al., 2012). A total of fifty rivers are coursing through the forests and lands of the province, ending in the surrounding seas (BPS Provinsi Maluku Utara, 2016). It is here, in the coasts and oceans of the province, that nature's bounty further unfolds.

The deep gradients of many of the province's shorelines are home to exceptionally diverse coral reefs, supporting a plethora of marine species. The region is host to two sites boasting the greatest recorded coral species richness per hectare of reef (in Halmahera), with ancient coral colonies (estimated to be more than 1,000 years old) continuing to thrive in these waters (Huffard et al., 2012).

The region provides essential foraging areas for the vulnerable leatherback turtle (*Dermochelys coriacea*) and hosts scattered nesting beaches for endangered green turtles (*Chelonia mydas*) and critically endangered hawksbill turtles (*Eretmochelys imbricate*) (Huffard et al., 2012). A wide range of whale and dolphin species can also be found in the waters of this province, with the region providing important cetacean migratory routes between the Pacific and Indian oceans (Kahn et al., 2017).

A BRIEF HISTORY OF NORTH MALUKU

Prior to the 15th century, the region was known to early Indian, Chinese, and Arab traders as part of the original 'spice islands'. At this time, the region was the sole source of cloves, attracting Portuguese interest in the early 16th century, followed by the Dutch establishing settlements on some of the islands from 1599. By 1667, the Dutch had seized control of the area, after which the region found itself embroiled in power struggles between conflicting colonial interests, being ruled by the British between 1796 and 1802, and again from 1810 to 1817, and occupied by the Japanese during World War II (from 1942 to 1945) (Gorlinski, 2014).

Following the war, the region joined the Republic of Indonesia, which had declared its independence from the Dutch on August 17, 1945 (though North Maluku was not formally recognized by the Dutch as being part of Indonesia until 1949).



USAID SEA / I R TARMIDI

The province is home to a population of more than a million people, approximately 53 percent of whom are coastal dwellers (BPS Provinsi Maluku Utara, 2011; BPS Provinsi Maluku Utara, 2016). The average population density for the province is 36 people/km² (BPS Provinsi Maluku Utara, 2016). Ethnically, the province is highly diverse, with groups including the Galela, Ternate, Makian, Tobelo, and Sula peoples. In Morotai and Halmahera (particularly northern and central Halmahera), many people of Chinese or Arab ancestry reside.

Education levels in the province have been increasing in recent years, with nearly all elementary and junior high school-age children attending school. Amongst the adult population however, 23 percent of the population have no formal education certification. (BPS Provinsi Maluku Utara, 2016). Almost two thirds of the population are of working age (15 years and over), with employment dominated by the agricultural sector (50 percent) (BPS Provinsi Maluku Utara, 2016), which includes farming, forestry, and fishing. Principal food crops grown in the region include rice, cassava, sweet potatoes, corn (maize), and peanuts (ground nuts). Vegetables such as green beans, tomatoes, soybeans, and mustard greens are also grown, as are avocados, citrus fruits, guavas, and papayas. Notable cash crops are cloves, cocoa, coconuts, nutmeg, and coffee. In addition to this, plywood, a product of the forestry sector, is an important export (Gorlinski, 2014).

Tourism is also an emerging economic and employment sector, due to the province's extraordinary natural heritage – from the wild and picturesque landscapes of the islands' interior to the white sand beaches of the coasts and its stunning underwater environment. In addition to this, the region has many historic attractions, including fortresses dating back to 1540 (built by the Portuguese and Dutch colonial powers during their occupations). The province also hosts regular events appealing to domestic and international visitors, including the Legu Gam and Kora-Kora festivals in Ternate and the Jailolo Bay festival in West Halmahera.

The minimum wage in the province is officially 1.65 million IDR/month (though informal sectors do not always earn this amount). Nearly seven percent of the population in the province is living at or below the national poverty standard, making North Maluku the 11th poorest province in the country (BPS Provinsi Maluku Utara, 2016).



Above: white sand beach in Sula, North Maluku

MARINE AND COASTAL MANAGEMENT IN NORTH MALUKU

In 2016, the province of North Maluku began the process of marine spatial planning (MSP) for the coastal waters under their jurisdiction (up to 12 nm from the coast), in order to map and categorize permissible (and non-permissible) activities in zones throughout these coastal waters. This has included providing dedicated small-scale fishing areas up to 2 nm from the coastline, within which permits for utilization are prioritized for fishing vessels under 10 gross tons (GT).

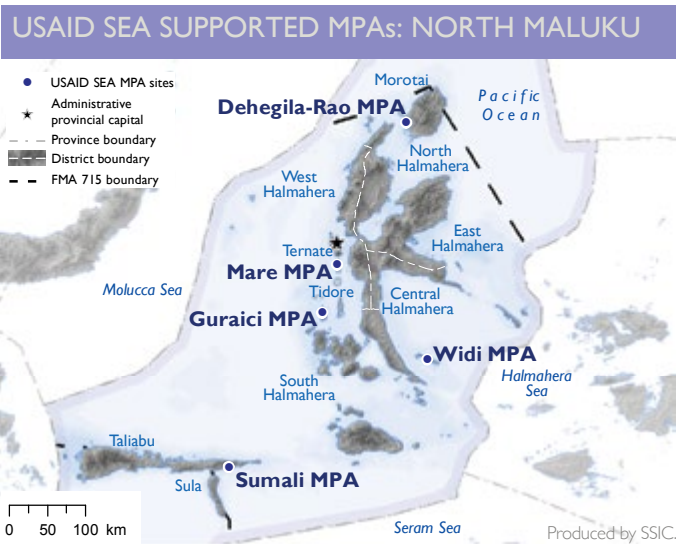
This process is ongoing and is led by the provincial fishery office and involves a range of governmental and civil society organizations and institutions¹. With support from the USAID SEA Project, this spatial plan (*Rencana zonasi wilayah pesisir dan pulau-pulau kecil – RZWP-3-K*) will improve the management of nearly 8,000,000 ha of North Maluku’s provincial waters.

KEY INDICATORS FOR NORTH MALUKU PROVINCE	BASELINE	5 YR TARGET
Number of hectares of biological significance and/or natural resources under improved natural resource management as a result of United States Government (USG) assistance, applying MSP	0 ha	7,969,718 ha

These planning efforts have generated momentum for identifying areas appropriate for the establishment of new MPAs, and re-galvanized commitment to effectively manage existing MPAs.

Prior to the MSP process, the province had already established five MPAs covering a combined total area of 17,408 ha, with the aim to conserve marine biodiversity (providing refuges for endangered, threatened, and protected [ETP] species) and promote the re-stocking of neighboring fishery grounds by protecting fish breeding areas, spawning aggregations, and enabling spillover. However, to date, most of these sites have remained at the status of ‘initiated’ (level one), with only Guraici MPA and Central Halmahera MPA beginning to transition to level two (MPA established), and none yet achieving effective management.

Therefore in 2016, the USAID SEA Project initiated support to further the management effectiveness of Mare and Widi (existing MPAs), the expansion of Rao into a larger MPA (Dehegila-Rao) on Morotai Island, the potential expansion of the MPA at Guraici, and the establishment of a new MPA in Sula Islands (Sumali MPA).



By 2021, the initiative aims to have achieved improved natural resource management of at least 218,074 ha of biologically significant natural resources in North Maluku, with at least 250 ha protected under no-take zone (NTZ) status and showing improved biophysical condition. Additionally, the project aims to have increased fish biomass by up to 10 percent in each MPA.

EXISTING MPAs IN NORTH MALUKU (2016)

DISTRICT / REGENCY	SHORT NAME	FULL NAME	SIZE (HA)
MOROTAI	Rao MPA	Rao Island Marine Conservation Area of Morotai Island Regency Current management effectiveness ranking: 100	330
TIDORE	Mare MPA	Small Island Reserve of Mare Island and Its Surrounding Sea, Tidore Municipality Current management effectiveness ranking: 96	2,810
CENTRAL HALMAHERA	Central Halmahera MPA	Small Island Reserve of Central Halmahera Regency Current management effectiveness ranking: 100	192
SOUTH HALMAHERA	Widi MPA	Suaka Pulau Kecil Halmahera Selatan Current management effectiveness ranking: 100	7,690
	Guraici MPA	Regional Marine Conservation Area of Guraici Islands and Its Surrounding Sea Current management effectiveness ranking: 100	6,386

Management effectiveness ranking based on E-KKP3K assessment.

KEY INDICATORS FOR NORTH MALUKU PROVINCE

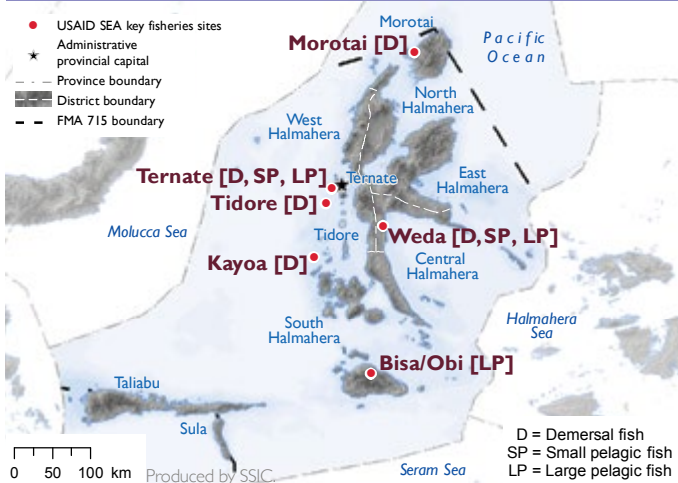
	Number of hectares of biological significance under improved natural resource management by applying MPA management as a result of USG assistance		Number of hectares of biological significance and/or natural resources showing improved biophysical conditions as a result of USG assistance		Percent change in biomass of reef fish in selected MPAs	
	BASELINE (ha)	5 YR TARGET (ha)	BASELINE (ha)	5 YR TARGET (ha)	BASELINE (kg/ha)	5 YR TARGET (kg/ha)
Dehegila–Rao MPA	0	Up to 58,011.39	0	Up to 5,801	4,162	+416 (4,578)
Mare MPA	0	At least 2,810	0	At least 281	620	+62 (682)
Widi MPA	0	At least 7,690	0	At least 769	1,874	+187 (2,061)
Guraici MPA	0	Up to 91,306.41	0	Up to 9,131	897	+90 (987)
Sumali MPA (new)	0	Up to 117,457	0	Up to 11,746	5,134	+513 (5,647)
TOTAL TARGETS *	218,074 ha		At least 250 ha		At least a 10% increase in fish biomass	

* Total targets are lower than the sum total of site targets. Figures reflect the minimum anticipated achievements for the province.



USAID SEA / I R TARMIDJI

USAID SEA SUPPORTED FISHERIES: NORTH MALUKU



FURTHER INFORMATION

about EAFM: see volume one, chapter four (action framework: fisheries)

about MPAs: see volume one, chapter four (action framework: establishing marine protected areas)

about MPA effectiveness rankings and the steps required to establish and effectively manage MPAs: see volume two, chapter three

The fishery resources of this province are estimated to provide livelihoods for more than 34,000 households (BPS Provinsi Maluku Utara, 2016). In addition to this, marine products are essential for food security, particularly for coastal communities who are highly marine resource-dependent. Marine products are harvested for local subsistence, domestic markets, and international trade.

In 2013, studies showed that the quantity of fish and marine products from North Maluku that were marketed through auction houses alone reached 99,275 tons (DJPB, 2013). However, as auction house transactions are a relatively small proportion of overall fishery harvests, this figure likely grossly under-represents the true fishery productivity of this region.

Key fishery products include large pelagic species (particularly tuna), small pelagic species (such as mackerels, scads, and anchovies), demersal fish species (such as grouper and snapper), as well as non-fish products such as lobster, shrimp, and squid. These are caught using a wide range of different gear types.

Under the USAID SEA Project, sustainable fisheries management began to be supported in 2016 through the implementation of an ecosystem approach to fisheries management (EAFM) targeting six different fishery regions across the province.

Above: fish for sale at domestic market in Sula, North Maluku

The support provided by the USAID SEA Project aims to improve the natural resource management of 2,390,915 ha of biological significance for fisheries by 2021, with selective areas expected to see up to a 10 percent improvement in catch per unit effort (CPUE). In addition to this, at least 400 small-scale fisher vessels will have been registered through support from the project.

KEY INDICATORS FOR NORTH MALUKU PROVINCE	BASELINE	5 YR TARGET
Number of hectares of biological significance and/or natural resources under improved natural resource management as a result of USG assistance, applying EAFM	0 ha	2,390,915 ha
Percent change in catch per unit effort for selected gear and landing sites	Data currently being analyzed (kg / unit of effort)	10% improvement
Number of small vessels registered	0	400

Through the work being implemented in spatial planning, MPA development, and sustainable fishery management, the USAID SEA Project will be trialing at least three innovations for marine and coastal management. To date, an innovative process for participatory mapping to support the development of the spatial plans has already been implemented, and a number of the fishery support sites are in the process of trialing I-Fish technology to support the collation and analysis of fishery data.

Overall, these support efforts aim to provide direct increased economic benefits to at least 150 people across the province, and ensure a more secure tenure for local custodianship or managed access in coastal waters for more than 650 individuals.

KEY INDICATORS FOR NORTH MALUKU PROVINCE	BASELINE	5 YR TARGET
Number of innovations supported with USG assistance	0	3
Number of people with increased economic benefits derived from sustainable natural resource management and conservation as a result of USG assistance	0	150
Number of people with more secure tenure or managed access	0	667

The support efforts underway in the province also aim to result in the appropriate development, adaptation, and/or production of at least four legislative products (laws, policies, strategies, plans, or regulations) to support biodiversity conservation. The first of these is already in development at the time of writing (the RZWP-3-K spatial plan).

In the coming years, legislative focus in North Maluku will be oriented towards two key areas: (1) addressing destructive fishing practices (particularly the supply of raw materials for bomb production and awareness of legal standing), and (2) strengthening networks to combat illegal fishing activities in the province, particularly ETP wildlife crime. In addition to this, efforts will be made at the ground level to support the establishment of community-based *pokmaswas*, to support surveillance and on-site management efforts in MPAs and key fishery areas. Through these activities, at least 60 individuals are anticipated to be applying improved conservation law enforcement practices in North Maluku by 2021.

KEY INDICATORS FOR NORTH MALUKU PROVINCE	BASELINE	5 YR TARGET
Number of laws, policies, strategies, plans, or regulations addressing biodiversity conservation officially proposed or adopted as a result of USG assistance	0	4
Number of people who apply improved conservation law enforcement practices as a result of USG assistance	0	60



FURTHER INFORMATION

about I-Fish technology, managed access, vessel registration, CPUE and steps required to achieve EAFM: see volume two, chapter four

about participatory mapping: see volume two, chapter three

about local custodianship of marine and coastal environments: see volume one, chapter four (traditional governance)

about law enforcement: see volume one, chapter four (action framework: enforcing the law)

about existing attitudes and behaviors being targeted across the region: see volume two, chapter five

about stakeholder training and capacity needs being addressed: see volume two, chapter six.

¹ Under the Governor of North Maluku, key entities involved in the marine spatial planning process are the provincial agencies for: Marine and Fisheries; Culture and Tourism; Agriculture; Forestry; Public Works; Transportation, Communication and Informatics; Education; Manpower and Transmigration; Health; Energy and Mineral Resources; Industry and Trade; Cooperatives, Small and Medium Enterprises (SMEs); and Social Services. In addition to this, the planning engages representatives from the Development Planning Agency at the sub-national level, provincial Environmental Council, the Community and Village Empowerment Council, as well as the Regional Disaster Management Agency, the Agricultural, Fisheries and Forestry Extension Coordination Body, the Regional Research and Development Body, and the Regional Secretariat.



Right: fish catch in Morotai, North Maluku

Underpinning all these efforts, the USAID SEA Project will provide necessary training and capacity building to at least 500 key stakeholders in the province, including government officials, fishers, collectors, community representatives, industry representatives, and relevant fisher and community associations.

In addition to this, awareness and behavior change campaigns will be implemented through select target MPAs and fishery sites in order to promote a greater understanding of the importance of sustainable management, the mechanisms to achieve sustainable management, and the adoption of sustainable practices.

KEY INDICATORS FOR NORTH MALUKU PROVINCE
BASELINE 5 YR TARGET

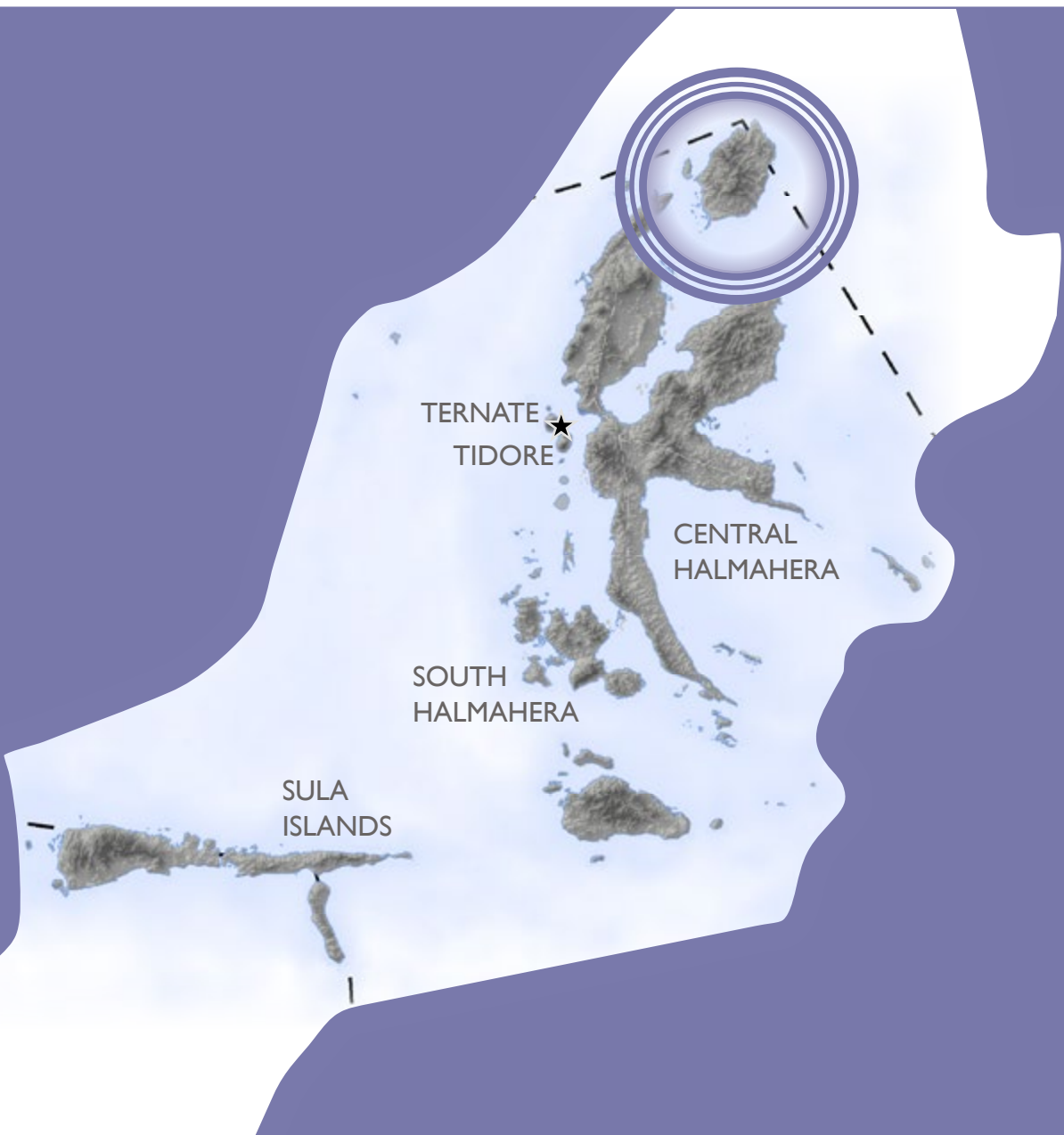
Number of people trained in sustainable natural resources management and/or biodiversity conservation as a result of USG assistance	0	500
Number of people demonstrating behaviors that contribute to biodiversity conservation, as a result of USG assistance	0	400

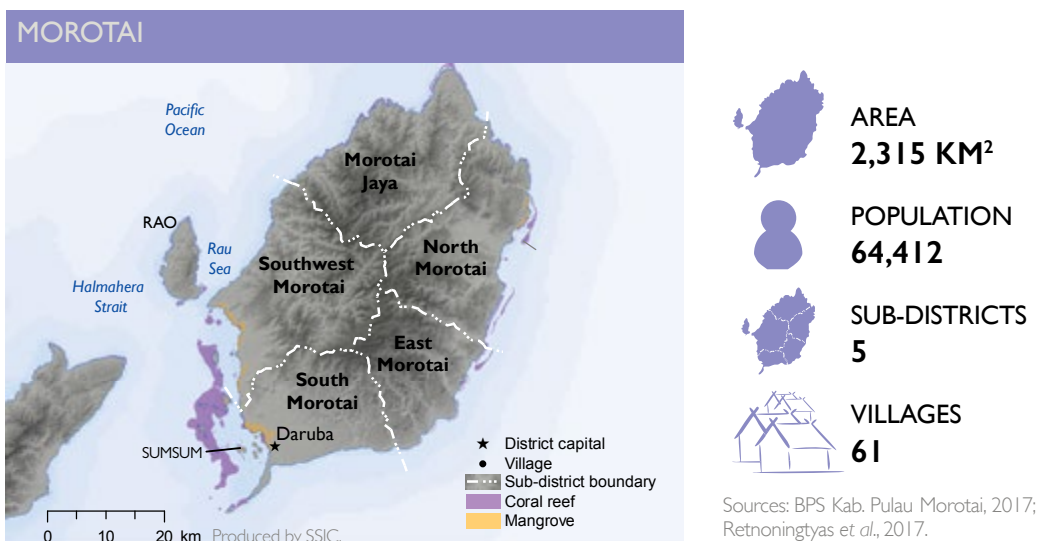
The remainder of this chapter explores the key fishery and MPA sites of focus in North Maluku province. We visit the sites and the people living here and discover what makes these areas so important to protect. We learn about the marine environment and fishery resources, the fishers and other marine resource users of the areas – and what steps are currently underway at each site to achieve sustainable management and to meet all of the above targets for the province.



CTC

MOROTAI





Morotai district is comprised of one large island and 33 small island clusters, five of which are inhabited. It is separated from Halmahera Island by a ten km stretch of ocean known as the Morotai Strait. The area has stunning coastal scenery and rich marine ecosystems, with corals in good health and a range of marine megafauna present, including, resident dolphins, a small dugong population, whitetip and blacktip sharks, and the rare walking shark (*Hemiscyllium halmahera*). It is also thought to be a migratory route for whales (Retnoningtyas *et al.*, 2017; Welly *et al.*, 2017b).

In addition to its wealth of marine and coastal attractions, the islands of Morotai are richly forested, with a rugged terrain resulting in beautiful scenery and stunning waterfalls. The islands also have a range of historic monuments and relics from various battles that took place in this region during World War II (WWII) including artillery shells, bunkers, warship wrecks, and runways. One of the smaller islands off the coast of Morotai (Sumsum island) was used as a headquarters and resting place for General MacArthur (and is today often referred to as ‘MacArthur Island’).

Due to its strategic geopositioning near the international border of Indonesia, Morotai has been designated as one of 12 ‘special economic zones’ in Indonesia (*Kawasan Ekonomi Khusus – KEK*) that are supported through facilities provisions and investments (UU no. 39/2009); and is one of ten new priority sites for tourism development in the country (Tamindael, 2016). The largest town in Morotai is Daruba on the south coast, where there is a seaport (under development) and an airport. Almost all of the settlements on the island are located near or on the coastline.

MOROTAI AT THE CENTER OF INTERNATIONAL MEDIA

The Nakamura waterfalls located on Morotai are named after Teuro Nakamura, a Taiwanese soldier who hid at the site during skirmishes on the island in WWII. He remained in hiding until 1974, unaware that the war was long over, and was only discovered when a pilot flying over the island noticed his hut hidden in the forest. The story of Nakamura’s discovery and his eventual return to his homeland in Taiwan made headlines around the world.

THE MARINE RESOURCES OF MOROTAI

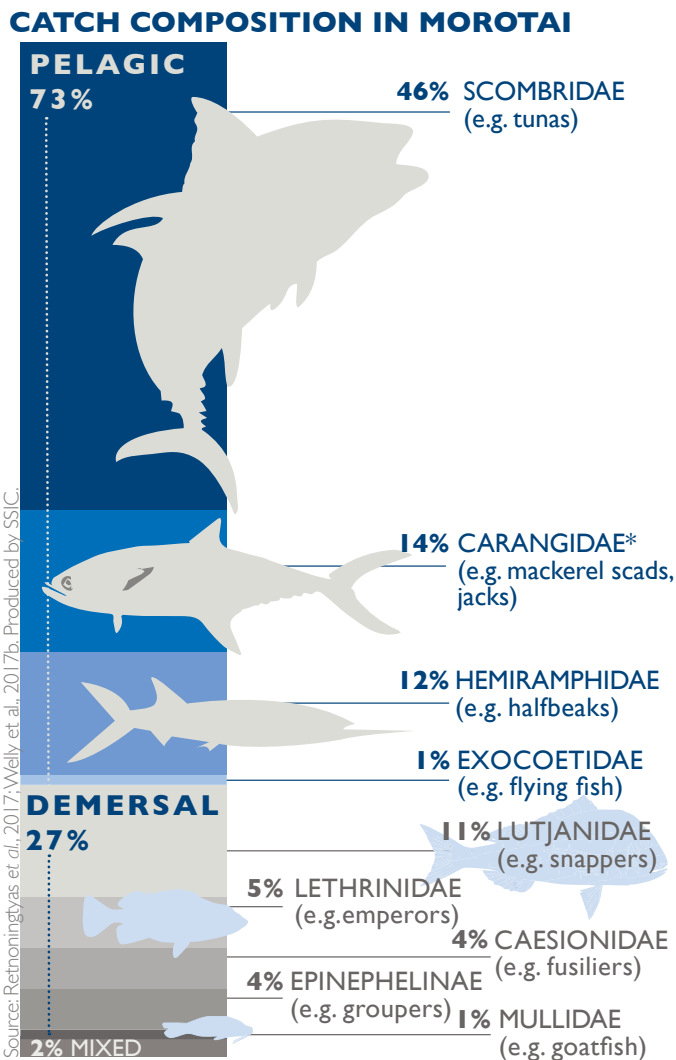
Fishery resources in these waters are diverse, with a range of large and small pelagic, demersal, and non-fish species harvested in the area. In terms of overall production, catches are dominated by pelagic species, with tuna, mackerels, scads, jacks, and halfbeaks making up 73 percent of the overall fisher catch (Retnoningtyas *et al.*, 2017; Welly *et al.*, 2017b). The results of surveys conducted through support from the USAID SEA Project show that large pelagics¹ are predominantly caught off the eastern shore, while off the western shore small pelagics are more common². Demersal fisheries³ are prevalent in the south and southwest sub-districts, with catches dominated by snapper species (*Lutjanidae*) (Retnoningtyas *et al.*, 2017; Welly *et al.*, 2017b).

A total of 1,586 fishing vessels are operating from within this district, 93 percent of which are unregistered and without any form of permit. Vessel sizes range from small non-motorized craft to vessels up to 20 m in length, powered by outboard engines up to 80 HP (Retnoningtyas *et al.*, 2017).

A wide range of different gear types are used in Morotai’s waters, with some vessels using more than one gear type at a time. The most commonly used are hand lines (1,310 units), followed by set gill nets (203 units) and kite lines (109 units), with other gears including surrounding nets, fish traps, spearguns, encircling gill nets, trolling lines, pole and lines, and lift nets (Retnoningtyas *et al.*, 2017).

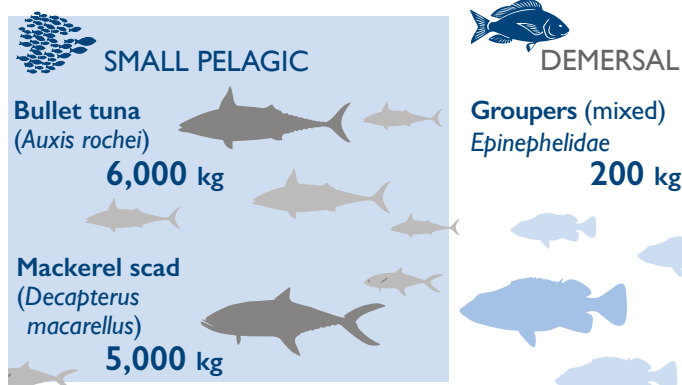
The most productive periods of the year in Morotai tend to be from June to August, with the least productive periods being September to January (Retnoningtyas *et al.*, 2017). Overall, fishery production from Morotai district is estimated at nearly 21.5 billion IDR/year (> USD 1.5 million), of which approximately 25 percent is accrued from demersal fisheries (Welly *et al.*, 2017b).

Given the region’s importance for fisheries and its location as a border district, Morotai has been identified as one of 20 centers for integrated marine and fisheries management



* This family can include both pelagic and demersal species; however, catch of *Carangidae* at Morotai is dominated by pelagic variants of this family.

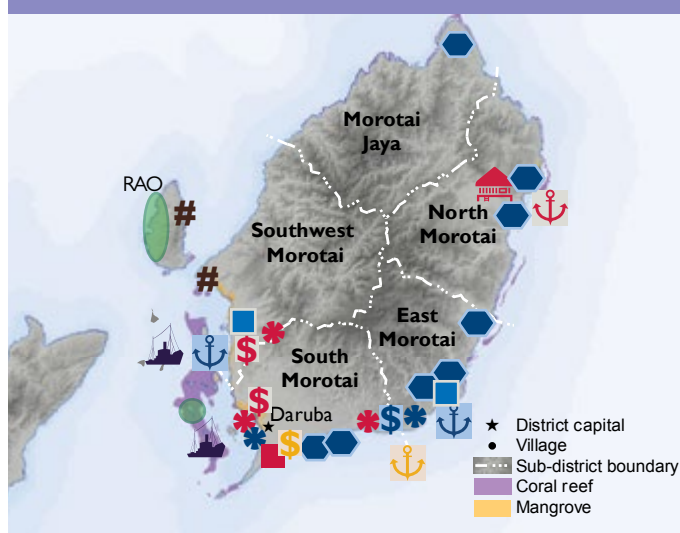
MAXIMUM CATCH VOLUME PER DAY: MOROTAI



* Catch figures shown are maximum yields (highest volumes) recorded from the region in one day. These figures do not reflect CPUE.

Source: Retnoningtyas et al., 2017. Produced by SSIC.

MOROTAI FISHERS, FLEETS & INFRASTRUCTURE



JETTIES

- 4 active
- 1 damaged
- 1 under construction

COLD STORAGE

- 2 active storage
- 1 inactive storage
- 2 active ice making
- 3 inactive ice making

MARKETS

- 1 active commercial
- 2 inactive commercial
- 1 active traditional

PROCESSING

- 12 smoking units

SHIP BUILDING

- 3 traditional ketinting boats

MARINE HANDICRAFTS

- 1 inactive handicrafts house

FISHER POPULATIONS

- > 100

KEY FISHING FLEETS

- > 50 vessels

in Indonesia (*Sentra Kelautan dan Perikanan Terpadu – SKPT*) (PerMen no. 51/2016). As an SKPT, the government is aiming to support the provision of necessary infrastructure and facilities to promote fisheries management, as well as support marketing, skill building, and local development goals (Marroli, 2017; Widiartanto, 2018).

Existing fishery support infrastructure across the district includes a range of facilities, though many remain incomplete, in development, or have become inactive due to disrepair. At the time of writing, a large fishing landing base (*Pangkalan Pendaratan Ikan – PPI*) is under construction in Daero Majiko village (Daruba PPI).

THE FISHERS OF MOROTAI

Surveys undertaken in Morotai revealed a total of 2,370 fishers distributed across the five sub-districts of Morotai. The largest concentration of fishers can be found on Rao Island, while the two most concentrated areas of fishing fleet operations (landings) are in the sub-districts of South and Southwest Morotai (Retnoningtyas et al., 2017).

Two fisher cooperatives (*koperasi*) exist in Morotai. These are membership-based groups that use monthly fees as loan capital to support cooperative members. These groups also provide social and cultural support to members, strengthen social

Source: BPS Kab. Pulau Morotai, 2017; Retnoningtyas et al., 2017. Produced by SSIC.

solidarity amongst fishers, and provide a platform through which any disputes may be resolved (Retnoningtyas *et al.*, 2017)⁴. The two cooperatives are the Jiko Rahmat Cooperative for demersal fishers (established through grant support from Gadjah Mada University), located in Kolorai Village, South Morotai (28 members), and the Tuna Abadi Cooperative, located in East Sangowo Village, East Morotai (32 members).

Average fisher incomes across the district are highly varied, ranging from part-time artisanal fishers operating out of non-motorized vessels earning an average of 750,000 IDR/month to the owners of pole and line operations earning an average of 27.8 million IDR/month (Welly *et al.*, 2017b). Based on surveys undertaken in the south and southwest sub-districts of Morotai, average household spending is 2,750,000 IDR/month. Key expenditure areas are household consumption (food) and children's education. This reveals that many of the smaller-scale fishers in the region are living below average means for the area.

PROMOTING SUSTAINABLE FISHERIES IN SOUTH / SOUTHWEST MOROTAI

As the two most concentrated areas of fishing fleet operations are the sub-districts of South and Southwest Morotai, this area has been identified as a priority for sustainable fisheries management (Retnoningtyas *et al.*, 2017).

These two sub-districts are host to exceptional marine biodiversity, so much so that two sites in particular have already started to become popular with scuba diving enthusiasts – the island of Mitita in the far southwest and the coastline of Wayabula. The presence of these healthy marine ecosystems means that implementing sustainable fisheries management systems at this stage will both optimize fishery productivity for the region and secure it into the future. At the same time, due to the existence of diving operations and an airport in this area (with plans to soon open direct flights to / from Jakarta), the region has considerable potential to bring alternative and additive livelihood opportunities to communities through the expansion of sustainable marine tourism.

A perception monitoring study conducted with a range of marine resource stakeholders⁵ in this region in 2017 reveals a relatively good foundational appreciation of the importance of the marine environment. However, it also reveals a lack of awareness of the damage that can be caused by destructive fishing and a sense that destructive practices are relatively commonplace in the area (CTC, 2017b). In addition to this, respondents to the survey felt that some species that were commonly found in the waters in the past were no longer present⁶ and that fishery yields could be impacted by the emerging tourism market, creating unsustainable demand locally (as experienced during a 'Sail Morotai' event in 2012, which was felt to generate excessive fishery extraction in a short period). These concerns further emphasize the importance of implementing sustainable practices in this region.

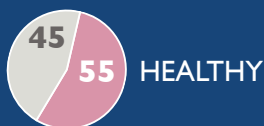
The southwest region is also host to the only existing MPA in Morotai, Pulau Rao, established in 2012 and covering an area of 330 ha. This MPA was initially established with the aim of protecting 1,810 m of nesting beach for green and leatherback turtles (Lestari, 2017). In 2016, the government proposed complementing this MPA with two further protected areas, to be located in the popular diving areas of Mitita and Wayabula, in order to protect these marine



PERCEPTIONS OF THE MARINE ENVIRONMENT IN MOROTAI

MARINE RESOURCES (%)

IN DECLINE / UNSURE



CORAL REEFS PROTECT THE SHORELINE
AGREE



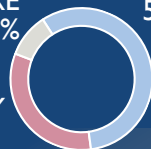
CORAL REEFS SHELTER FISH
AGREE



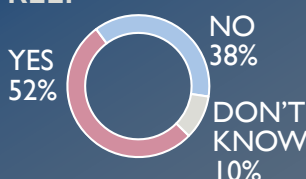
FISH CATCHES

UNSURE 10% IN DECLINE 57%

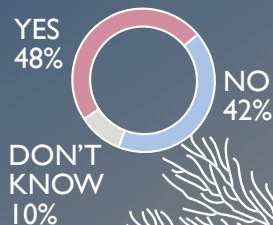
HEALTHY 33%



DESTRUCTIVE FISHING DESTROYS CORAL REEF



IS LOCALLY COMMON



SOURCE: Coral Triangle Center (2017b).
Produced by: SSC.

habitats for tourism business opportunities. However, based on the results of surveys conducted in the region, it has become clear that developing a larger, zoned MPA, covering more of the region, will more effectively secure wider habitats to support both the replenishing of fishery stocks and maximize sustainable tourism opportunities.

Therefore, an expanded MPA is now in the process of being established – the Dehegila–Rao MPA. It will cover up to 58,011 ha (including the existing Pulau Rao MPA), within which more than 5,000 ha of coral reef habitat will be protected, along with 100 ha of mangroves and key turtle nesting sites.

¹ Key large pelagic species: yellowfin tuna (*Thunnus albacares*) and skipjack tuna (*Katsuwonus pelamis*), yielding up to 800 and 1,300 kg per trip respectively.

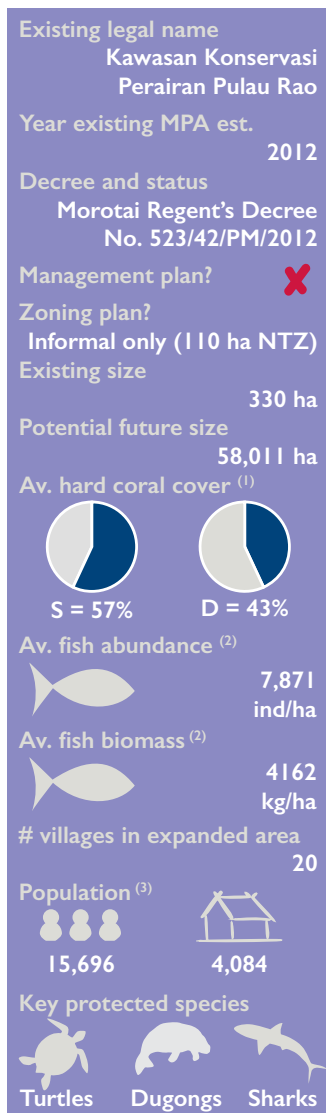
² Key small pelagic species: bullet tuna (*Auxis rochei*), Lutke's halfbeak (*Hemiramphus lutkei*), mackerel scad (*Decapterus macarellus*), and island trevally (*Carangoides orthogrammus*).

³ Key demersal species: **Snapper species:** Bengal snapper (*Lutjanus bengalensis*), crimson snapper (*L. erythropterus*), blackspot snapper (*L. fulviflamma*), and Indian snapper (*L. madras*), as well as the saddleback snapper (*Paracaesio kusakarii*), green jobfish (*Aprion virescens*), and deepwater red snapper (*Etelis carbunculus*). **Grouper species:** comet grouper (*Epinephelus morhua*), coral trout (*Plectropomus maculatus*). **Others:** hind fish (*Cephalopholis microprion* and *C. sonnerati*), fusiliers (*Caesionidae*), emperors (*Lethrinidae*), goatfish (*Mullidae*).

⁴ In addition to these cooperatives, government grant groups are occasionally established in the district, active for the duration of particular government-led aid initiatives related to fisheries. These groups are at times received with mixed feelings by communities and fishers, as they sometimes consist of individuals unrelated to fishing, which can create tensions within communities. At the time of writing, none of these groups are active.

⁵ Stakeholder respondents in perception monitoring: total = 40. Fishers (n=18), Civil servants (n=11), government and contract workers (n=11). 82 percent male, 18 percent female. The majority (55 percent) earn less than 1 million IDR/month. Note: the scale of the study only provides an insight into perceptions and does not represent the entire area in a statistically robust fashion.

⁶ Key species considered absent from Morotai waters in recent years: Napoleon wrasse (*Cheilinus undulatus*), chocolate grouper (*Epinephelus pacycentrum*), deep pugnose ponyfish (*Secutor ruconius*), goldband fusilier (*Pterocaesio chrysozona*), bigeye trevally (*Caranx sexfasciatus*), and halfbeaks (*Hemiramphus* sp.).



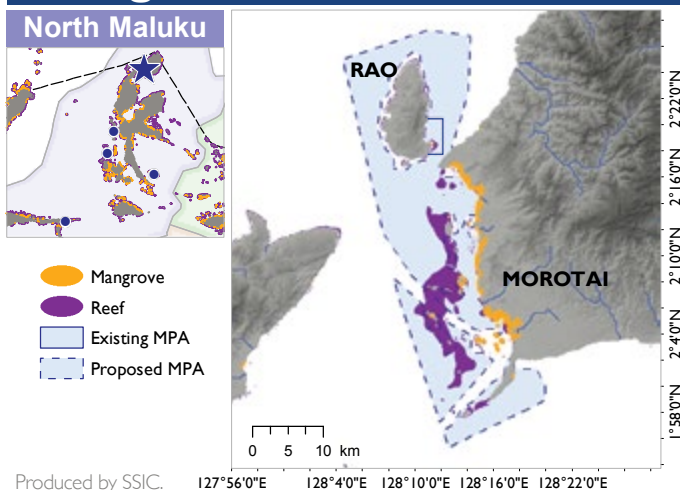
¹ Based on 50m Point Intercept Transect (PIT) x 3 replicates. S= shallow (3m), D = deep (10m). n= 12 sites (Welly et al., 2017b).

² Based on Underwater Visual Census (UVC) belt transects (50m x 5), and timed swims of 20 mins (~400m). Fish abundance ranged from lowest 1,262 ind/ha in South Dodola to highest 12,478 ind/ha in North Dodola. Biomass ranged from 718 kg/ha in South Dodola to highest 7,122 kg/ha in West Kolorai (rounded data; Welly et al., 2017b).

³ BPS, 2011.

Right: blacktip reef shark observed during surveys

Dehegila-Rao MPA



Current management effectiveness ranking: 100



The expansion of Rao MPA into a new site covering more than 58,000 ha will support the protection of vital marine habitats, and will include no-take zones to provide refuges for endangered and threatened species, protect spawning aggregations, and promote the re-stocking of neighboring fishing grounds. Surveys undertaken in 2017 revealed 45 families and 138 genera of reef fish in this potential expanded MPA area, including 28 species of grouper and 13 species of snapper (Welly et al., 2017b). Overall, 11 families of key commercially important fish can be found in this region⁷. The area is also host to extensive seagrass beds, providing foraging grounds for turtles and dugongs, with seven species of seagrass recorded⁸ (Welly et al., 2017b).

The MPA will promote opportunities for sustainable tourism, capitalizing on the region's rich ecosystems and exciting underwater environment. Blessed by long stretches of sandy white beaches and stunning coastal vistas, the region is already attracting an emerging tourism market. With the waters of the MPA host to two pods of resident dolphins, a small dugong population, resident whitetip and blacktip sharks that appear to be tolerant of scuba diving visitors, the rare walking shark (*Hemiscyllium halmahera*), and whales, the effective protection of this area will provide considerable opportunity for the expansion of this market in the future, which will in turn incentivize the long-term sustainable management of the region's natural resources.

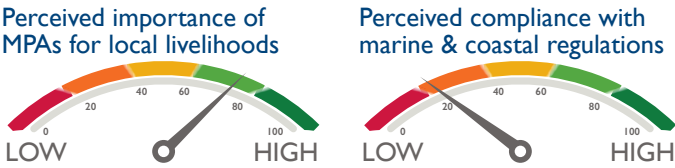
⁷ 11 key commercially important fish families: snappers (*Lutjanidae*), groupers (*Serranidae*), rabbitfish (*Siganidae*), parrotfish (*Scaridae*), surgeonfish (*Acanthuridae*), giant trevally (*Carangidae*), grunts (*Haemulidae*), emperors (*Lethrinidae*), pelagic fish (*Scombridae*), fusiliers (*Caesionidae*), and goatfish (*Mullidae*).

⁸ Recorded seagrass species: *Enhalus acoroides*, *Halophila spinulosa*, *Halophila ovalis*, *Cymodocea rotundata*, *Cymodocea serrullata*, *Halodule pinifolia*, and *Thalassia hemprichii*.

SUMMARY USAID SEA PROJECT SUPPORT

STEPS TO EFFECTIVE MPA MANAGEMENT SUPPORT (2016-2021)											NOTES
Level 1			Level 2			Level 3			Level 4		Level 5
MPA proposed	Inventory & area ID	Reservation of area	Management unit & personnel	Management & zoning plans	Facilities & infrastructure	Management funding	Plans approved	Management (SOPs)	Plans implementation	Designation (legal) of MPA	
										Boundary marking	
										Institutionalization	
										Resource management	
										Socioeconomics supported	
										Community welfare improved	
										Sustainable funding	
(1)	(1)	(1)	✓	✓	✓	✓	✓	✓	✓		Independent MPA
											Optimally managed MPA
											Minimally managed MPA
											Established MPA
											Initialized MPA

for a full description of the activities being implemented under each of these steps: see volume two, chapter three



Studies reveal a good existing awareness of the importance of an MPA for livelihoods; however, few individuals are considered to currently comply with regulations regarding marine and coastal resources (CTC, 2017b).

Therefore, key behavior changes anticipated through this work:

- Increased compliance with marine and coastal regulations
- Willingness to engage in expanded MPA design and planning
- Willingness to comply with MPA zoning, including no-take zones
- Adoption of sustainable tourism best practices for visitor management

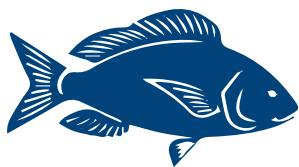
Target audiences: Fishers, collectors, community members

Key capacity-building support areas provided:

- Resource mapping and management planning
- MPA management
- Sustainable fisheries management
- Sustainable tourism best practices

Target audiences: Management unit, community members, fishers

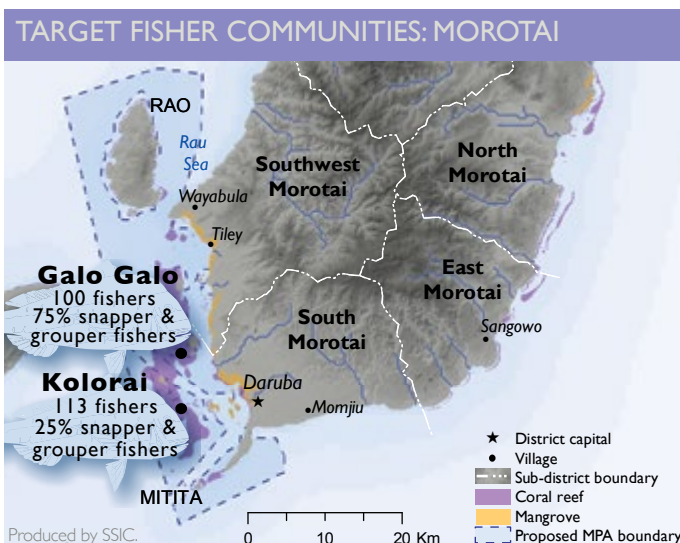




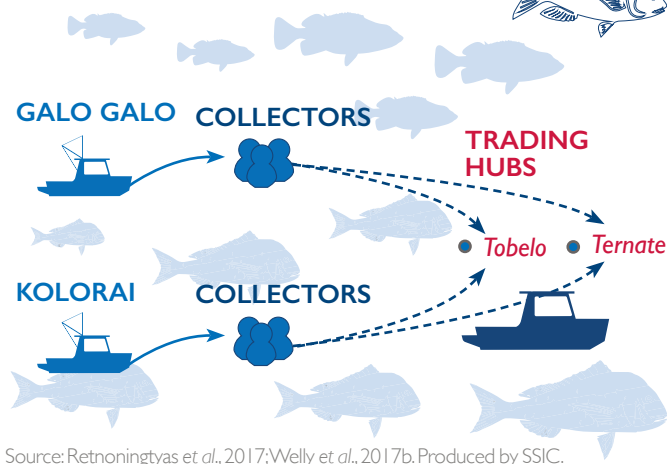
DEFENDING DEMERSALS

In addition to establishing and effectively managing an expanded MPA in these two sub-districts, work is underway to support the sustainable management of demersal fisheries, particularly grouper and snapper fisheries, in two key areas: **Galo Galo village** and **Kolorai village**.

In both communities, demersal fishing is undertaken on small boats (3 GT), between 7 and 11 meters in length. Catches are often sold to a fish collector, who then moves the product through the supply chain. In the case of snapper and grouper, these collectors generally sell on to two key trading hubs, Ternate and Tobelo (in North Halmahera) as well as locally within the region.



DOMESTIC SNAPPER & GROUPEr SUPPLY CHAIN MOROTAI



Relationships between fishers and fish collectors in the region are complex. Usually, each fish collector works with specific fisher groups (of up to 20 fishers) to whom the fish collector has provided loans and financial capital for fishing operations. This is often necessary, as operating costs for hand line fishing alone in this region can rise to 1.5 million IDR per fishing trip (up to 17 hours in duration); these costs are exacerbated by the lack of government-sponsored fuel provisions (*Solar Package Dealer Nelayan – SPDN*) or price regulated services (*Agen Premium dan Minyak Solar – APMS*) in the area. Under such loan arrangements, fishers in the region are commonly faced with a situation known as ‘a trap of indebtedness’.

Finally, the region is facing challenges from outside fishers coming into the area, including vessels from the Philippines. This creates undue competition over fish resources and can lead to on-water disputes over fishing grounds.

To address these issues, fishery assessments are underway at the time of writing with the aim to identify potential sustainable management interventions. In addition to this, incentive opportunities are being explored through the use of an economic rate of return (ERR) model.

for more information on the trap of indebtedness, SPDN and APMS: see volume two, chapter four

SUMMARY USAID SEA PROJECT SUPPORT

UNDERTAKING FISHERY ASSESSMENTS

Undertaking assessments for demersal fisheries in the target locations. Utilizing an I-Fish compatible software (WCS-Fish) to synchronize data management with the government fishery database.

STOCK
ASSESS

I-FISH

INCENTIVIZING SUSTAINABLE FISHERIES

Exploring and implementing incentives for both sustainable fisheries and MPA compliance through the economic rate of return (ERR) model being developed under the project.

INVEST

MONITORING, EVALUATION & MANAGEMENT

Trialing small-scale fisher logbooks, promoting vessel registration (*Sistem Informasi Izin Kapal Daerah – SIMKADA*), and the establishment of community surveillance groups (*pokmaswas*).

LOG
BOOKS

VESSEL
REG

ECONOMIC RATE OF RETURN MODEL TRIALED AT THIS SITE

ERR

**for a full description of these activities:
see volume two, chapter four**

Studies reveal there is already some level of existing willingness amongst target stakeholders to avoid using destructive practices on reefs and consuming ETP species, and to report any destructive practices or marine violations observed.

However, more efforts are required to ensure that such sustainable practices are adopted wholeheartedly across society and that stakeholders engage more proactively in sustainable fisheries management.

Therefore, key behavior changes anticipated through this work:

- Increased appreciation of the need for proactive sustainable fisheries management
- Willingness to comply with logbooks and vessel registration
- Willingness to engage in / support / comply with incentive opportunities implemented
- Willingness to engage / participate in community surveillance

Target audiences: *Fishers, collectors, processors, facility managers, government*

Key capacity-building support areas provided:

- Logbook usage and SIMKADA
- Sustainable fisheries management (including post-harvest management)
- Sustainable marine tourism
- Monitoring methodologies and implementation
- Harvest control design and implementation

Target audiences: *Fishers, collectors, government*

Commitment to report
destructive practices



Commitment to avoid using
destructive practices



Commitment to avoid
consuming juvenile fish

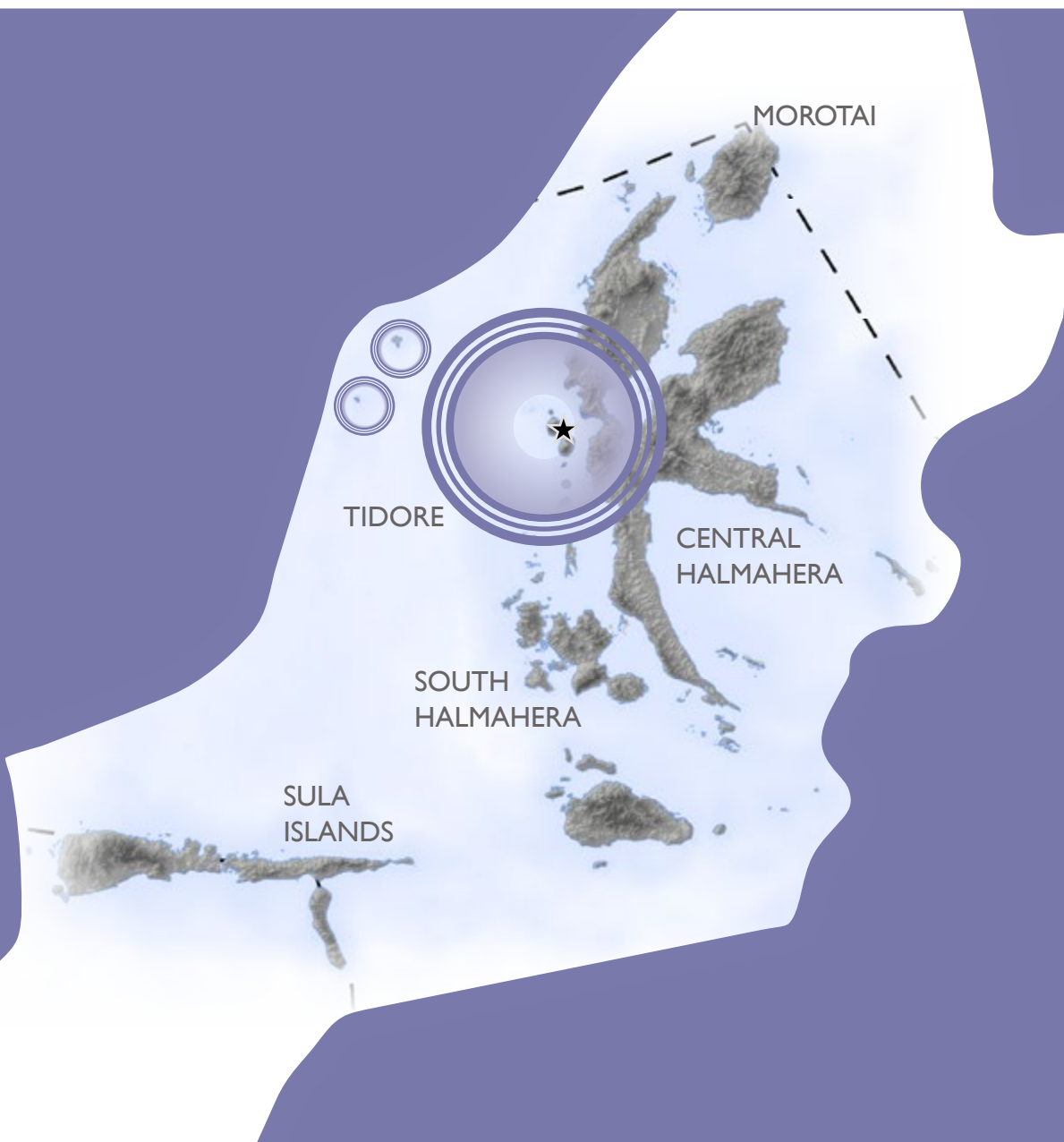


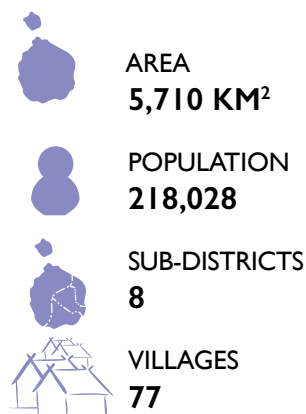
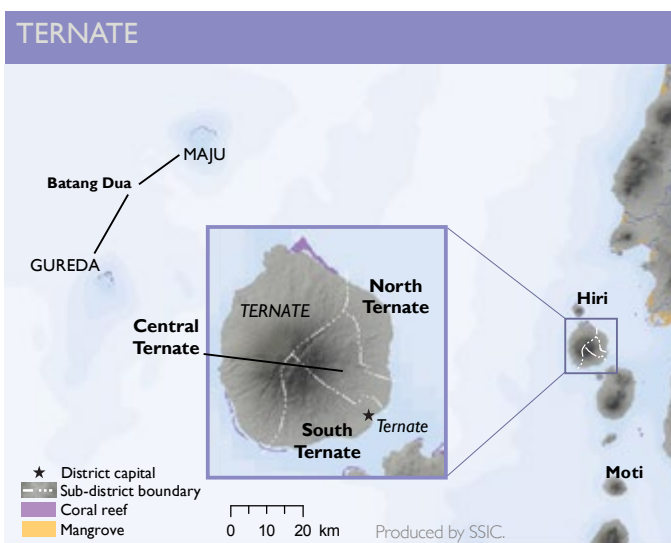
Commitment to avoid
consuming ETP species



Right: Morotai fisher

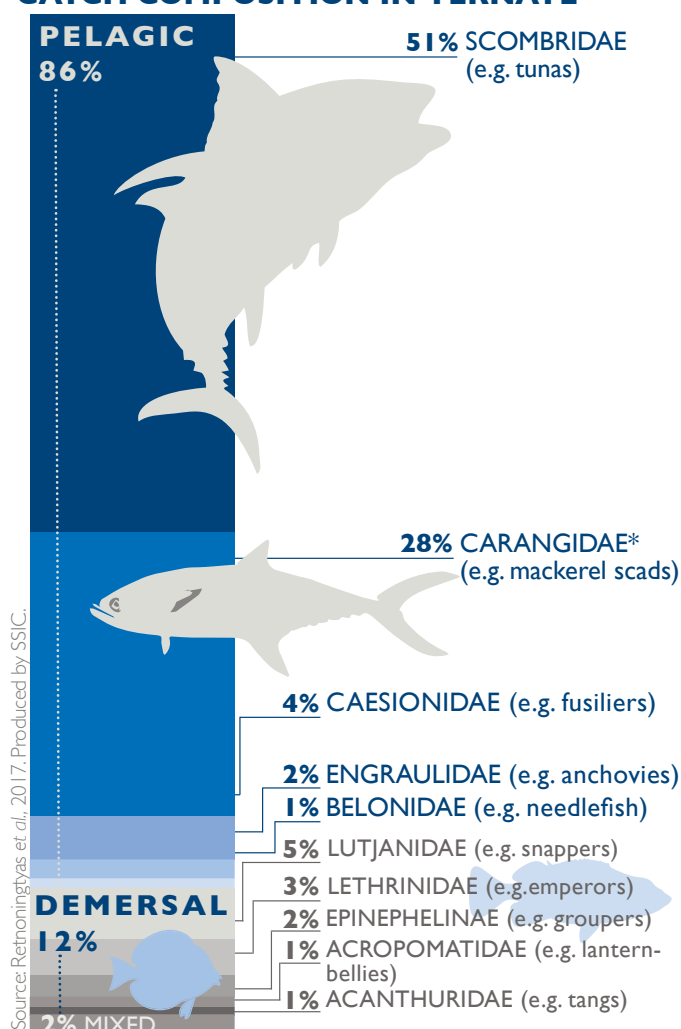
TERNATE





Sources: BPS Kota Ternate, 2017, Retnoningtyas et al., 2017.

CATCH COMPOSITION IN TERNATE



* This family can include both pelagic and demersal species; however, catch of *Carangidae* at Ternate is dominated by pelagic variants of this family.

Ternate is comprised of three large islands and five smaller islands. The area is divided into eight sub-districts, situated across a wide geography, including the very remote islands of Batang Dua (BPS Kota Ternate, 2017). All of the region's islands are blessed with beautiful coastlines, mangroves, and coral reefs, providing rich fishery resources for the area.

THE FISHERY OF EASTERN TERNATE

Surveys conducted under the USAID SEA Project in 2017¹ revealed that the fishery of Ternate is dominated by pelagic species from the *Scombridae* family (51 percent) and *Carangidae* family (23 percent) (Retnoningtyas et al., 2017).

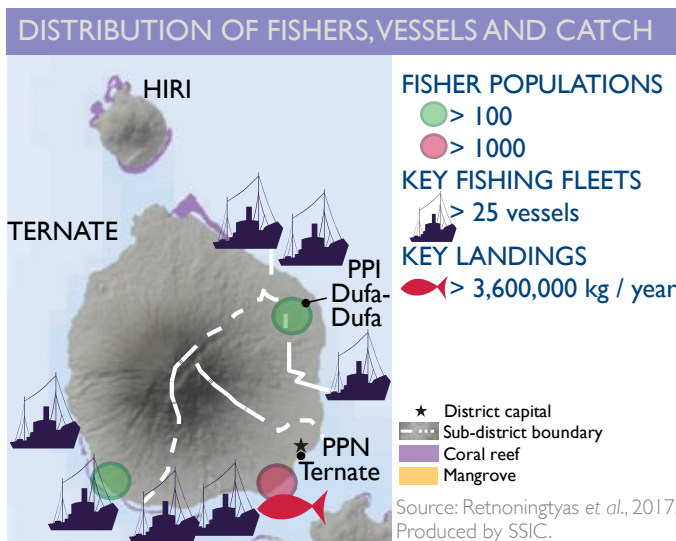
Commonly caught large pelagic species include skipjack tuna (*Katsuwonus pelamis*) and yellowfin tuna (*Thunnus*

albacares), with small pelagic catches dominated by mackerel scad (*Decapterus macarellus*), bullet tuna (*Auxis rochei*), bigeye scad (*Selar crumenophthalmus*), anchovies (*Encrasicholina punctifer*), and Indian mackerel (*Rastrelliger kanagurta*).

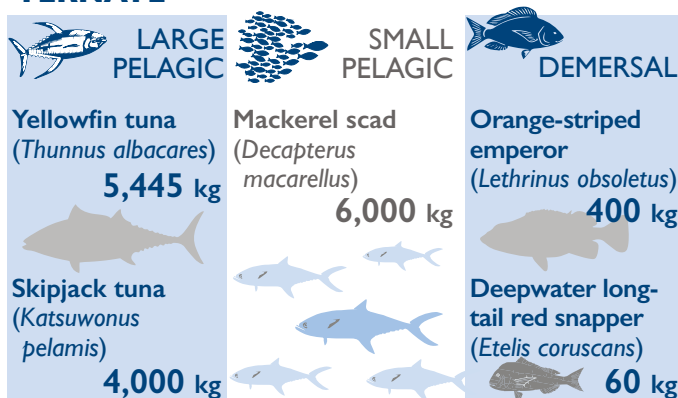
Key demersal species caught in these waters are snap-pers² (*Lutjanidae*), emper-ors (*Lethrinidae*), fusiliers (*Caesionidae*), and groupers³ (*Epinephelidae*).

In total, fish from 22 fish fami-lies and 58 species have been identified in fisher catches in the region (Retnoningtyas et al., 2017).

The densest concentration of fishers operate out of the coastal villages of Dufa-Dufa, where there is a regional fish landing base (*Pangkalan Pendaratan Ikan – PPI*); South Ternate (*Bastiong Talangame Village*) where there is a national fisheries port (*Pelabuhan Perikanan Nusantara – PPN*); Northwest Moti and Hiri Island (totaling 3,918 fishers in 1,434 households). These fishers are operating

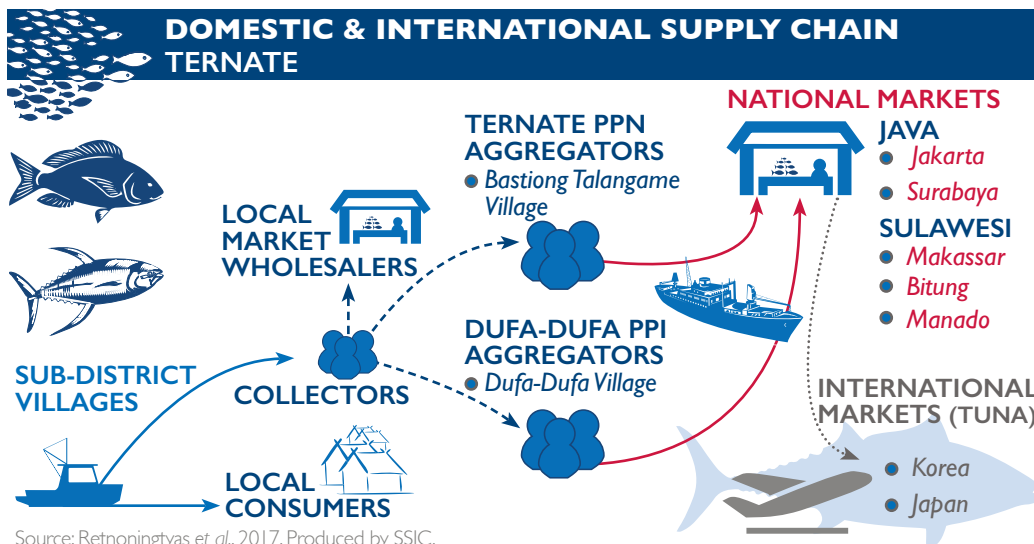


MAXIMUM CATCH VOLUME PER DAY: TERNATE



* Catch figures shown are maximum yields (highest volumes) recorded from the region in one day. These figures do not reflect CPUE.

Source: Retnoningtyas et al., 2017. Produced by SSIC.



with 671 vessels of various sizes, from non-motorized boats (dugouts) to small boats with locally made outboard engines (*mesin ketinting*), and vessels with standard-issue outboard engines (from 15 to 180 HP). In addition to this, some few boats used by pole and line fishers (*huhate*) have inboard engines.

The densest concentration of fish landings in this region can be found at PPN Ternate, and overall, fishery productivity in the region came to 28,719 tons in 2016 (BPS Kota Ternate, 2017).

Across all the sub-districts of Ternate, the fish harvested tend to be predominantly utilized for local subsistence and domestic sale, with fishers or their wives trading directly with consumers in their own villages.

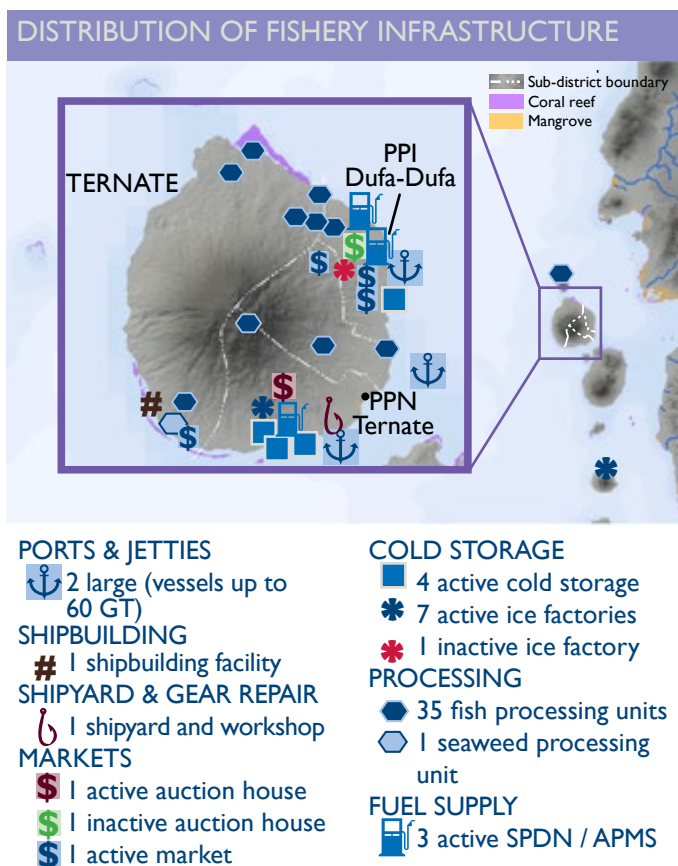
However, every village also has a fish collector who operates as a middleman for wider trading. In Ternate, these collectors predominantly trade with wholesalers in local markets, who take the fish on a sale or return basis (only paying for the fish once they are sold on to the consumer). Collectors will also trade with aggregators (larger-scale collectors) in PPN Ternate and PPI Dufa-Dufa. These aggregators trade the fish on to national markets in Bitung, Manado, Jakarta, Makassar, and Surabaya. From these locations, some species, particularly tuna, are then traded overseas, predominantly to Korea and Japan (Retnoningtyas *et al.*, 2017).

Fishery infrastructure in the region is centered around the two fishing ports of PPN Ternate and PPI Dufa-Dufa. Each of these ports is equipped with jetties able to accommodate vessels up to 60 GT, and a range of fishery facilities. The area is also host to 35 fish-processing facilities, producing predominantly smoked fish, shredded fish, fish-meatballs, and fish sauce products.

In other areas, infrastructure is very limited. Moti Island has one ice-making factory, and only one ship-building facility remains operational in the region, at Kastela village. One APMS is located in Tafure village, but overall provision of fuel is insufficient for the fishers' needs.

This lack of sufficient infrastructure, facilities, and services creates considerable challenges for the fishers, inflating operational costs, leading to unnecessary wastage of product, and minimizing potential profit margins.

Even in the relatively busy areas of PPN Ternate and PPI Dufa-Dufa, fishers struggle to find the capital necessary for operations, and a number of investor groups have arisen whereby collectors provide the upfront costs for fishing in return for sole rights for purchase of the product. While this supports fishers by providing the capital they need, it can also create a trap of indebtedness.



Source: Retnoningtyas *et al.*, 2017. Produced by SSIC.

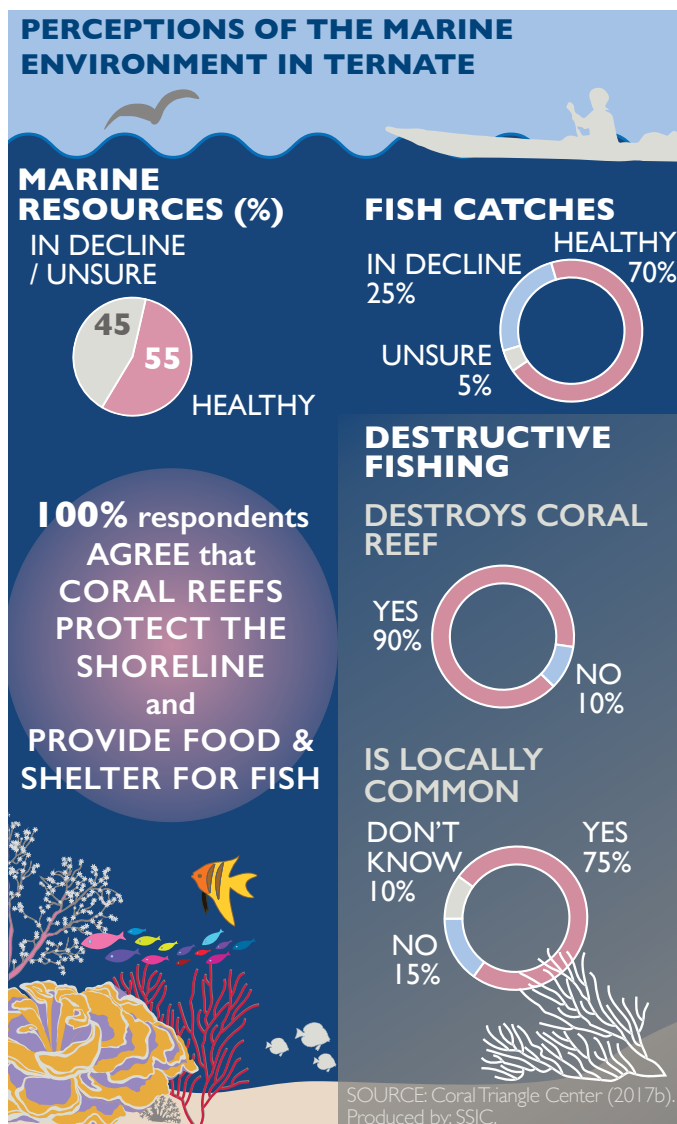
In addition to this, government grant groups have existed to date in almost every coastal village in the region but have attracted criticism from some fishers for having limited engagement with members. 'Joint business groups' (*Kelompok Usaha Bersama – KUBs*) have also been formally established in the region, particularly with fishers in Dufa-Dufa. Through these groups, fishers can access government grants of often significant value (such as funding to purchase vessels larger than 30 GT). However, consensus amongst KUB members has also been challenging, and they have so far failed to address many of the challenges the fishery faces, with fishers reverting to indebtedness scenarios, leading to continued wastage of product, over-extraction of resources, and unsustainable fisheries management.

Perception-based surveys conducted with a range of marine resource stakeholders in this region⁴ in 2017 revealed that destructive fishing activities are regarded as commonplace in the area

and that some species that were commonly found in the waters in the past are no longer present⁵. Some respondents (25 percent) also felt that ETP species are traded locally (CTC, 2017b).

This same study, however, revealed an excellent foundational appreciation of the importance of the marine environment, suggesting a level of support is already established for moving towards a more sustainable fisheries management approach.

Therefore, to address some of these challenges and capitalize on the existing positive awareness of the importance of sustainable management, the USAID SEA Project is working in the Dufa-Dufa region of Ternate Island to support EAFM implementation. Efforts include assessing the status of the fishery, identifying appropriate fishery management interventions, exploring incentivization and investment opportunities, and engaging fishers in managing their resources sustainably and profitably.



¹ These surveys focused only on the areas of Ternate that are situated in the east, adjacent to the main Halmahera land mass.

² Key common snapper species: *Aphareus rutilans*, *Etelis carbunculus*, *E. coruscans*, *Lutjanus argentimaculatus*, *L. bohar*, *L. carponotatus*, *L. erythropterus*, *L. lemniscatus*, *L. malabaricus*, *L. monostigma*, *Paracaesio kusakarii*, and *Pinjalo lewisi*.

³ Key common grouper species: tomato hind (*Cephalopholis sonnerati*) and freckled hind (*Cephalopholis microprion*).

⁴ Stakeholder respondents in perception monitoring: Total = 20. Civil servants (n=15), other (private sector, part-time / contract workers, teachers, and seasonal fishers) (n=5). 70 percent male, 30 percent female. The majority (80 percent)

SUMMARY USAID SEA PROJECT SUPPORT

UNDERTAKING FISHERY ASSESSMENTS

Undertaking assessments for demersal and pelagic fisheries in the target locations. Utilizing an I-Fish compatible software to synchronize data management with the government fishery database.

STOCK
ASSESS

I-FISH

IMPLEMENTING FISHERY INTERVENTIONS

Contributing to the development of a fisheries management plan using EAFM, identifying fisher groups for trialing interventions and assisting the implementation of the plan.

INPUT &
OUTPUT
CONTROL

MARKETS

INCENTIVIZING SUSTAINABLE FISHERIES

Exploring opportunities to incentivize compliance with fisheries management interventions.

INVEST

MONITORING, EVALUATION & MANAGEMENT

Trialing small-scale fisher logbooks, promoting vessel registration (SIMKADA), and the establishment of a community surveillance group (*pokmaswas*) on the ground. Synchronizing work plans with wider agencies to effectively implement the one-stop service (PTSP).

LOG
BOOKS

VESSEL
REG

for a full description
of these activities: see
volume two, chapter four

Studies reveal there is already a good level of existing willingness amongst target stakeholders to avoid using destructive practices on reefs, though readiness to report any violations is not yet forthcoming. Likewise, there is already a strong commitment to avoiding the consumption of ETP species, whilst preparedness for consuming juveniles is more wavering.

Therefore, key behavior changes anticipated through this work:

- Increased appreciation of the need for proactive sustainable fisheries management
- Willingness to comply with logbooks and vessel registration
- Willingness to engage in / support / comply with trial interventions
- Willingness to engage / participate in community surveillance

Target audiences: Fishers, collectors, processors, facility managers, government

Key capacity-building support areas provided:

- Logbook usage and SIMKADA
- Sustainable fisheries management (including post-harvest management and value-add opportunities)
- Harvest control design and implementation
- Community surveillance Standard Operating Procedures (SOPs)

Target audiences: Fishers, collectors, government

Commitment to report destructive practices



Commitment to avoid using destructive practices



Commitment to avoid consuming juvenile fish



Commitment to avoid consuming ETP species



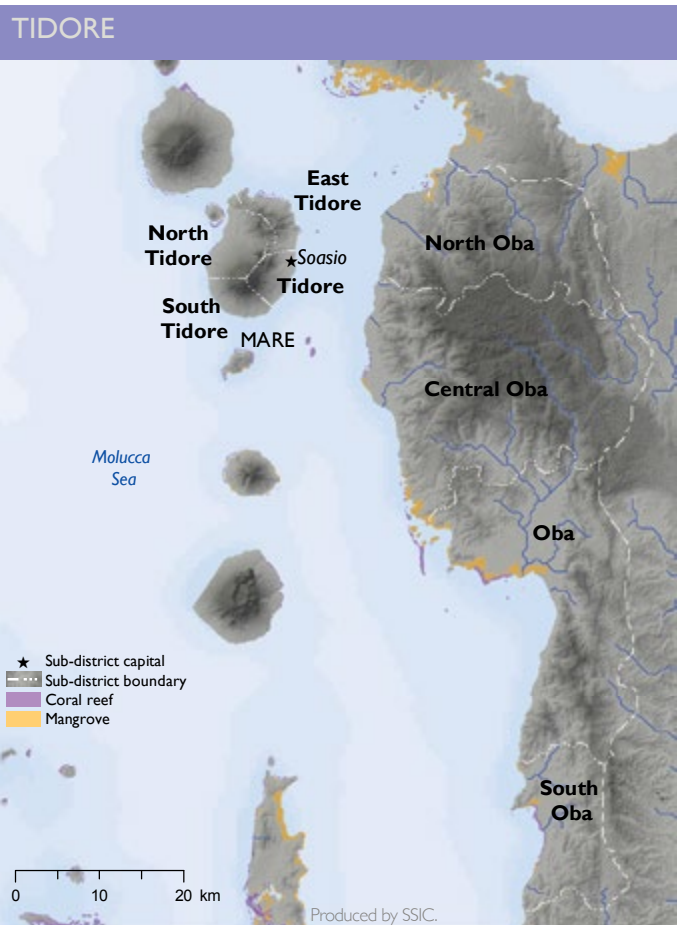
earn between 1 and 5 million IDR/month. Note: the scale of the study only provides an insight into perceptions and does not represent the entire area in a statistically robust fashion.

⁵ Key species considered absent from Ternate waters in recent years: hairfin anchovy (*Thrissina baelama*), Napoleon wrasse (*Cheilinus undulatus*), orange-lined triggerfish (*Balistapus undulatus*), rabbitfish (*Siganus sp.*), snappers (*Lutjanus sp.*), stingrays (*Dasyatis sp.*).

TIDORE



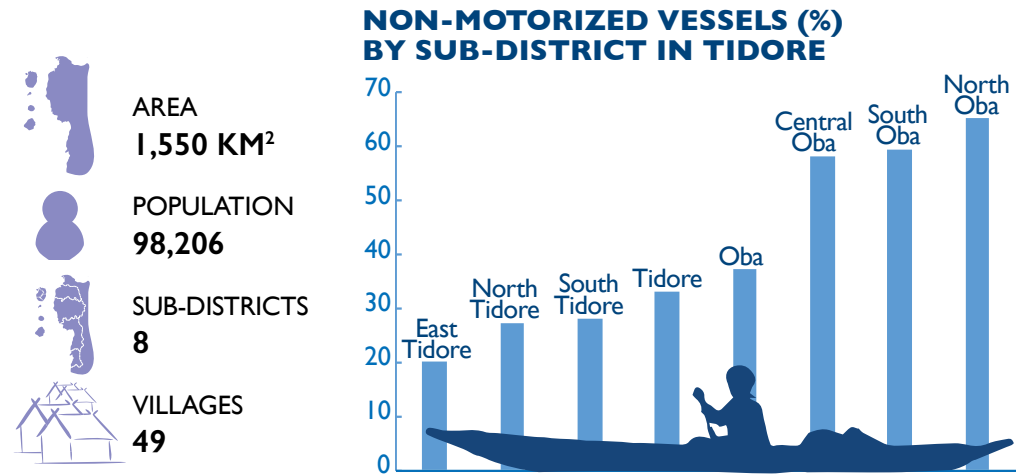
The Tidore Islands municipality covers both the island of Tidore and an eastern area of Halmahera land mass. Similar to Ternate, this area is blessed with beautiful beaches, inland forests, and historic forts. The region is host to lush mangrove forests, seagrass beds, and coral reef ecosystems that have been relatively undisturbed and are in good condition (Ishak and Herdiana, 2017). These systems support a diverse fishery, predominantly comprised of large pelagic, small pelagic, and demersal species.



THE TIDORE FISHERY

Surveys conducted in Tidore in 2017 identified at least 2,356 fisher residents across Tidore Islands municipality (1,798 fisher households), operating with a total of 1,709 fishing vessels (Retnoningtyas *et al.*, 2017).

In some sub-districts the majority of fishers work from non-motorized vessels, such as in North Oba (65 percent), Central Oba (58 percent), and South Oba (59 percent), whilst in the other sub-districts the move to motorized vessels in recent years has been greater (BPS Kota Tidore Kepulauan, 2017).



Sources: BPS Kota Tidore Kepulauan, 2017; Retnoningtyas *et al.*, 2017.

Source: BPS Kota Tidore Kepulauan, 2017. Produced by SSIC.

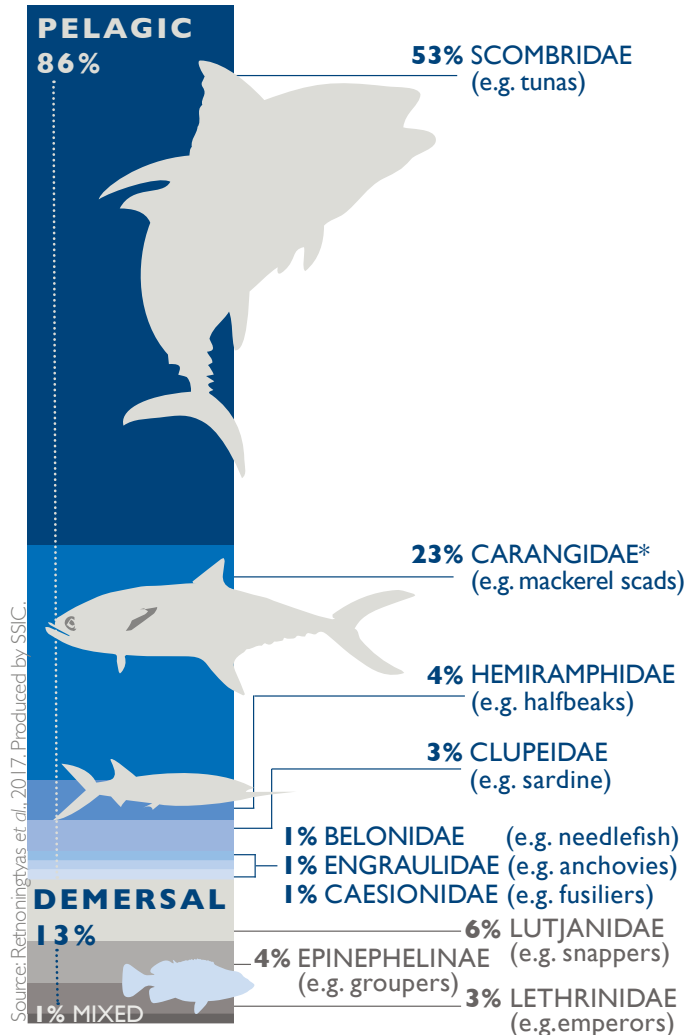
Overall catch composition from the region is dominated by pelagic species, with tunas and mackerels (*Scombridae*) contributing more than 53 percent of the total catch, followed by smaller pelagics such as jacks and scads (*Carangidae*) contributing 23 percent (Retnoningtyas et al., 2017).

Key large pelagic species fished in these waters include skipjack tuna (*Katsuwonus pelamis*) and yellowfin tuna (*Thunnus albacores*). Key small pelagic species include bullet tuna (*Auxis rochei*), mackerel scad (*Decapterus macarellus*), and bigeye scad (*Selar crumenophthalmus*)¹ (Retnoningtyas et al., 2017).

The demersal fishery is comprised of a wide range of species but is dominated by snappers (*Lutjanidae*)², groupers (*Epinephelidae*)³, emperors (*Lethrinidae*), and fusiliers (*Caesionidae*) (Retnoningtyas et al., 2017).

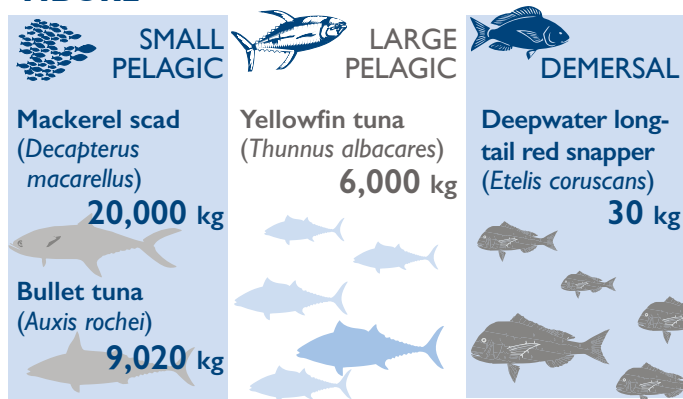
Fishers use a wide range of different gear types to harvest these target species, with some vessels using more than one gear type at a time. In the 2017 survey the most common gear types found in use⁴ were hand lines, trolling lines and gill nets. Other less commonly used gears found were: surrounding nets (with and without purse seines), muro-ami fish traps, spearguns, kite lines, pole and lines, bottom long lines, and push nets (Retnoningtyas et al., 2017).

CATCH COMPOSITION IN TIDORE



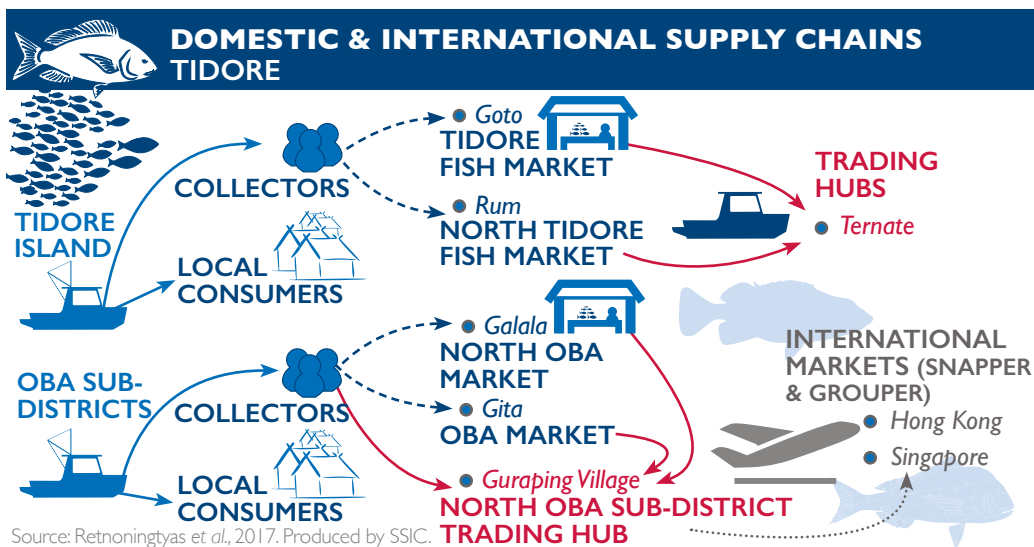
* This family can include both pelagic and demersal species; however, catch of *Carangidae* at Tidore is dominated by pelagic variants of this family.

MAXIMUM CATCH VOLUME PER DAY: TIDORE



* Catch figures shown are maximum yields (highest volumes) recorded from the region in one day. These figures do not reflect CPUE.

Source: Retnoningtyas et al., 2017. Produced by SSIC.



Fishing fleet operations tend to be concentrated out of East Tidore, Central Oba, and Oba sub-districts. However, the greatest landings of fish (kg) can be found in South Tidore sub-district (Tomalou village) and North Tidore sub-district (North Maitara village), with landings averaging more than 12,000 kg/day and 10,000 kg/day respectively (Retnoningtyas et al., 2017).

Across all the sub-districts, fish harvests tend to be predominantly utilized for local subsistence and domestic sale, with fishers or their wives trading directly with consumers in their own villages. However, every village also has a fish collector who operates as a middleman for wider trading. The largest trading occurs through Guraping village in North Oba sub-district, particularly for snapper and grouper species, where fish are sold on to Hong Kong and Singapore (Retnoningtyas et al., 2017).

Across the region, several forms of fisher associations are established, though few are particularly active now. For example, in South Tidore sub-district (Tomalou village), one fisher cooperative (*koperasi*) known as Ngom Tabea exists as well as several joint business groups (KUBs). Other government grant groups have been occasionally formed across the region related to specific activities and grant periods (after which the groups have been dissolved).

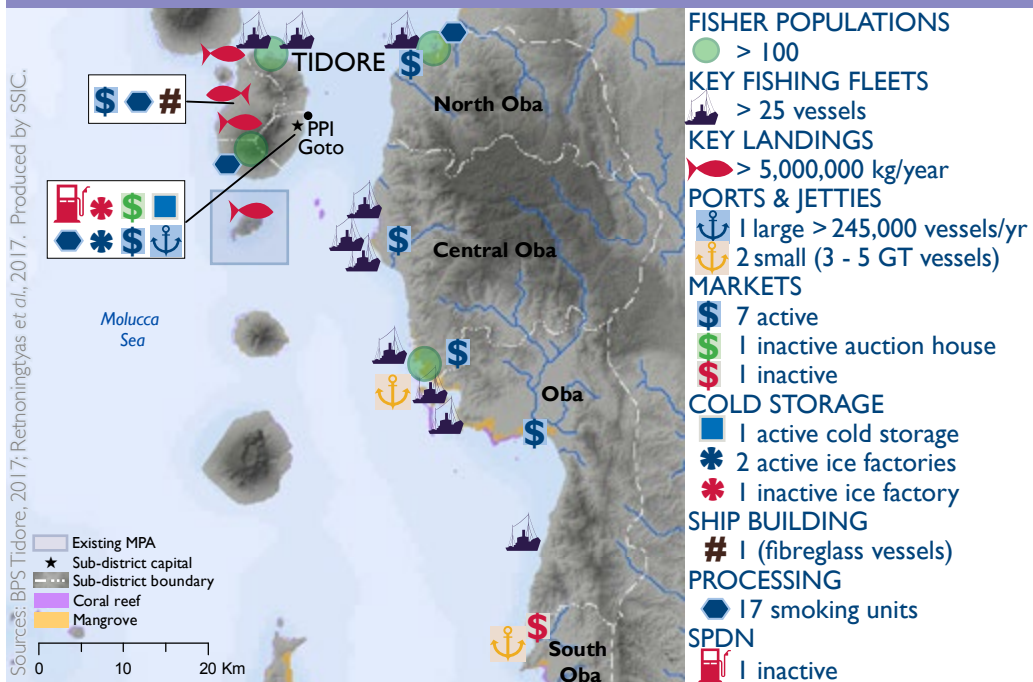


Fishery infrastructure is limited and varies across the region, with activities centered around the main PPI port in Tidore, Goto village.

Tidore is also host to one existing marine protected area located at Mare Island; however, the MPA remains at the status of 'initiated' and is not yet effectively managed.

Left: mackerel for sale

TIDORE POPULATION, FISHERS, FLEETS & INFRASTRUCTURE



SUSTAINABLY MANAGING TIDORE'S MARINE RESOURCES

To promote sustainable marine and coastal management in Tidore Islands Municipality, the USAID SEA Project is focusing support towards two key snapper and grouper fisher communities (Goto and Guraping) as well as the communities in and around Mare MPA, in order to advance the effective management of the area. The majority of villagers in this area are Tidorese, with settlers also present from Makian, Ambonese, and Bugis ethnicities.

- **Goto village** is host to relatively good fishery infrastructure, with the only PPI in the region and functioning cold storage facilities, but much of it is in disrepair. There are 28 snapper and grouper fishers resident in the area, in addition to which the site is important as a key hub for domestic trading of snapper and grouper species from other communities.
- **Guraping** is the location for the largest snapper and grouper trading (including to international markets) and is thus an important site for snapper and grouper fishers from across the region.



USAID SEA



Right: Tidore seascape

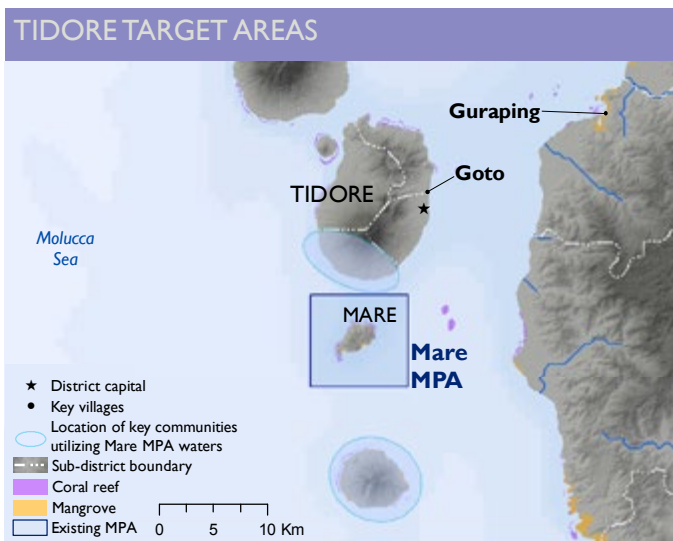
Both of these areas are key destinations for snappers and groupers traded from the 13 communities that fish the waters in and around the Mare MPA. Nearly half of the fishers from these communities operate in small vessels with outboard engines, and living conditions are generally relatively high⁵ (Lestari, 2017).

The key fishery challenges faced by these communities are infrastructural, with insufficient (or inoperative) cold storage or ice-making facilities. Only 43 percent of households have their own small refrigeration systems (already insufficient for catch storage), and electrical supply, while present, is unstable, hindering household ice-making efforts. In addition to this, roads around the region are not in good condition, with mostly dirt tracks, hampering travel to markets, with delays leading to product spoilage and loss of earnings.

This wastage and lack of realization of potential profits is a key driver of over-extraction in the region. Studies have shown that, while there is an excellent abundance of reef fish, they are of generally smaller sizes than in other regions, which is a key indicator of overfishing. In addition to this, the lack of government grants (or lack of prioritization for granting) and the absence of SPDN support mean that fishers are faced with paying higher premiums for goods such as fuel for boats, inflating their overall operating costs and reducing profit margins. This in turn can lead fishers to try and maximize catch by any means during each trip, creating perverse incentives for destructive and over-extractive practices.

Many fishers also have secondary incomes, the most common being farming (54 percent) as well as casual labor and trade (24 percent). For some, farming is the main livelihood (with fishing being secondary); crops include subsistence food (corn, cassava, legumes, etc.) and saleable commodities such as clove, nutmeg, cacao, coconut, and cashew.

Efforts to support these communities are underway, and re-galvanizing the Mare MPA is at the heart of these efforts.



Key communities that fish in Mare's water include:

- Maregam and Marekofu (on Mare Island)
- Dokiri, Tuguiha, Tomalou, Gurabati, and Tongowai (on Tidore island)
- Tafamutu, Kota Moti, Tadenas, Tagafa, Takofi, and Figur (in neighboring Moti island under the jurisdiction of Ternate).

Source: Lestari, et al., 2017. Produced by SSIC.

¹ Other common pelagic species include Lutke's halfbeak (*Hemiramphus lutkei*) and Indian mackerel (*Rastrelliger kanagurta*).

² Key common snapper species include: *Lutjanus bohar*, *L. carponotatus*, *L. erythropterus*, *L. fulviflamma*, *L. lutjanus*, *L. malabaricus*, *L. rivulatus*, *Aphareus rutilans*, *Etelis carbunculus*, *Pinjala lewisi*, and *Etelis coruscans*.

³ Key common grouper species include: *Cephalopholis microprion*, *C. miniate*, *C. sonnerati*, *Epinephelus morrhua*, and *E. poecilonotus*.

⁴ The three most common gear types found in use in Tidore through the 2017 surveys were hand lines (897 units), followed by trolling lines (477 units) and gill nets (112 encircling and 117 set gill net units).

⁵ Household assets indicate relatively good living conditions for the region. 98 percent of houses have electricity, 85 percent have a television, 92 percent have a cellphone, and most live in solid housing (98 percent with metal roofs and 89 percent with cement / plastered walls).

Legal name
Suaka Pulau Kecil Pulau
Mare dan Laut Sekitarnya,
Kota Tidore Kepulauan

Year est. 2012

Decree and status
Decree of the Mayor
of Tidore Islands no.
72.2/2012

Management plan? ✗

Zoning plan? ✗

Size 2,810 ha

Av. hard coral cover ⁽¹⁾

S = 37% D = 47%

Av. fish abundance ⁽²⁾ 27,795 ind/ha

Av. fish biomass ⁽²⁾ 620 kg/ha

villages 2

Population ⁽³⁾

912 100

Key protected species

Dolphins

¹ Based on 50m PIT x 3 replicates. S = shallow (< 4m), D = deep (10m). n = 8 sites. Substrates = 7 categories (Muttaqin et al., 2017).

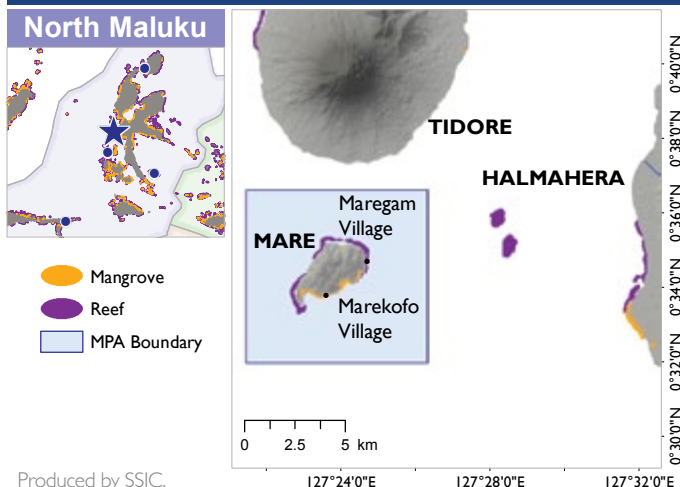
² Based on UVC belt transects (50 x 5m), timed swims of 60 mins x 3 replications. Fish abundance ranged from lowest 14,400 ind/ha to highest 45,707 ind/ha*. Biomass ranged from lowest 471 kg/ha to highest 799 kg/ha*. *No significant difference ($P < 0.05$) was found between Mare MPA and control site (n= 3) (rounded data; Muttaqin et al., 2017). ³ Lestari, 2017.

The coral reefs are in relatively good condition, and a resident pod of dolphins can be reliably seen at dawn and dusk in Dolphin Bay (*Kahia Masolo*) to the east of the island, offering an attraction for potential sustainable tourism development. Other attractions include four historical Dutch forts, located on hillsides and peaks, with trails for hiking and viewing the agricultural activities of daily island life. The island is also well known in the region for its unique clay, with pottery production being a key livelihood in Maregam village, providing further interest for potential visitors to the area. Entire households are involved in this work, with women generally making the pottery, while men travel the region to sell the products².

Therefore, with effective management in place, including appropriate zoning to protect key fishery productivity sites and areas of tourism potential, the Mare MPA can support both fisher livelihoods and promote alternative income generation through sustainable marine tourism. This brings opportunities for enhanced overall revenue generation locally and incentivizes biodiversity conservation and sustainable management of the area.

Mare MPA

North Maluku



Current management effectiveness ranking: 96



Mare is located around four km south of Tidore Island. It has a steeply sloping landscape and is surrounded by a fringing reef, seagrass beds, and 25 ha of mangroves¹ (Ishak and Herdiana, 2017). Thirty-three different fishing grounds have been identified within the MPA, visited by fishers from across the region, and one small home-based aquaculture initiative exists, farming milkfish from wild-caught juveniles.

Twenty-five percent of the population living in the two villages on the island (Maregam and Marekofo) are fishers, mostly working with hand line gears and nets. However, in Marekofo village, a unique fishing technique is used known as *kalase*. Here, a 60 m x 11 m net is adorned with coconut leaves that drive the fish to remain in the net as it is drawn into a circle around them and dragged to the boat. Therefore, the marine environment of this MPA is vital for local livelihoods and cultural practices as well as the livelihoods of fishers coming from neighboring villages on the islands of Tidore and Moti.

SUMMARY USAID SEA PROJECT SUPPORT

STEPS TO EFFECTIVE MPA MANAGEMENT SUPPORT (2016-2021)															NOTES	
Level 1			Level 2			Level 3			Level 4			Level 5				
MPA proposed	Inventory & area ID	Reservation of area	Management unit & personnel	Management & zoning plans	Facilities & infrastructure	Management funding	Plans approved	Management (SOPs)	Plans implementation	Designation (legal) of MPA	Boundary marking	Institutionalization	Resource management	Socioeconomics supported	Community welfare improved	Sustainable funding
Achieved pre-USAID SEA Project support			✓	(1)	(2)	(2)	✓	✓	✓				✓	(2)	✓	
																Independent MPA
																Optimally managed MPA
																Minimally managed MPA
																Established MPA
																Initialized MPA

for a full description of the activities being implemented under each of these steps: see volume two, chapter three

IN GOTO AND GURAPING COMMUNITIES:

UNDERTAKING FISHERY ASSESSMENTS

Undertaking assessments for demersal and small pelagic fisheries in the target locations. Utilizing an I-Fish compatible software to synchronize data management with the government fishery database.

MONITORING, EVALUATION & MANAGEMENT

Trialing small-scale fisher logbooks, promoting vessel registration (SIMKADA), and the establishment of a community surveillance group (*pokmaswas*).

Key behavior changes anticipated:

- Increased recognition of the value of healthy marine resources for livelihood opportunities
- Willingness to comply with MPA zoning, including no-take zones
- Willingness to comply with MPA management regulations
- Adoption of sustainable tourism best practices for visitor management
- Willingness to engage / participate in community surveillance
- Willingness to comply with logbooks and vessel registration [Goto & Guraping only]

Target audiences: Fishers, community members, MPA management unit [Goto & Guraping only – fishers, collectors]

Key capacity-building support areas provided:

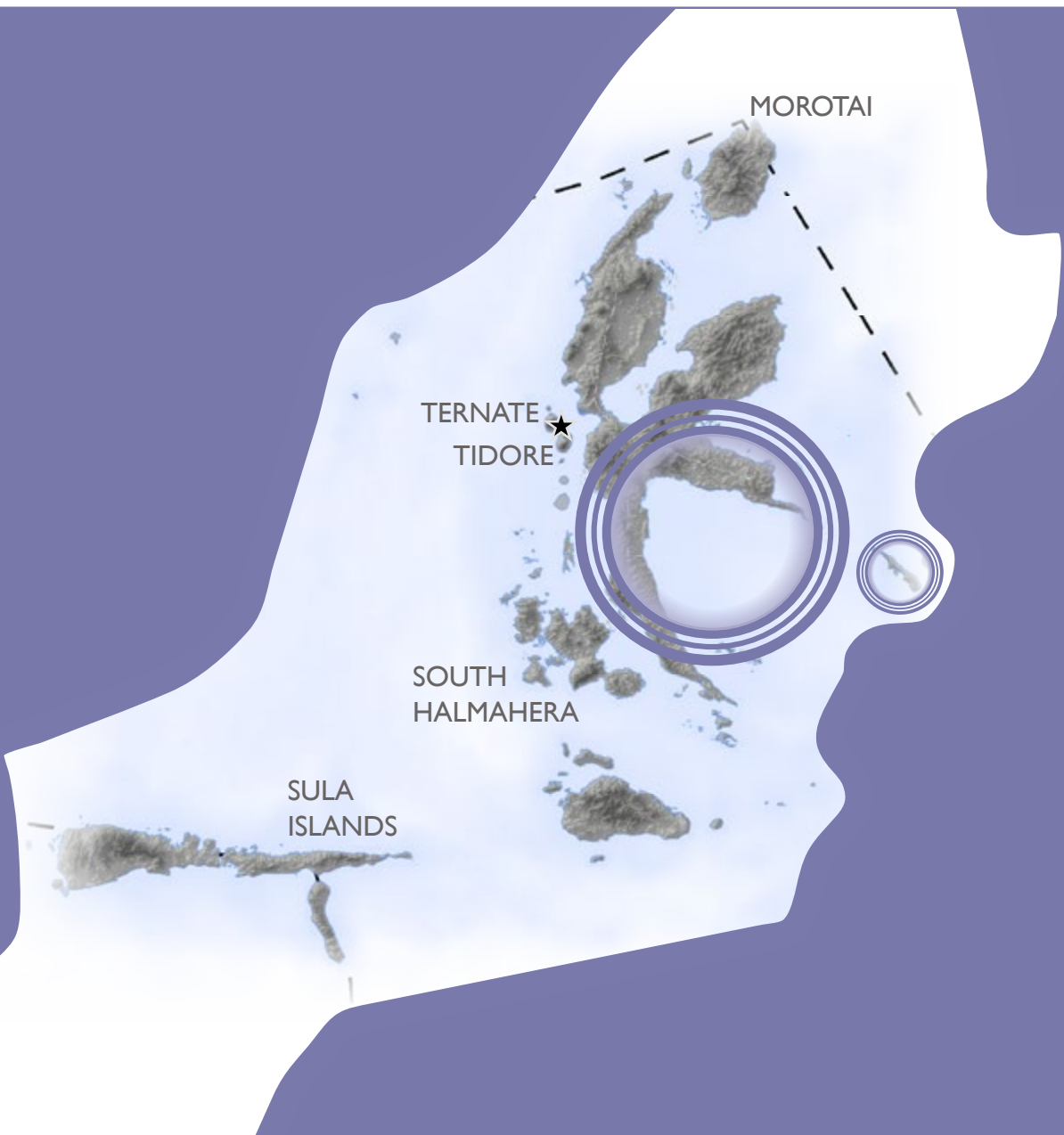
- Resource mapping and management planning
- MPA management
- Sustainable fisheries management
- Sustainable tourism best practices
- Logbook usage and SIMKADA [Goto & Guraping only]
- Sustainable fisheries management (including post-harvest management) [Goto & Guraping only]

Target audiences: Fishers, community members, MPA management unit [Goto & Guraping only – fishers, collectors]

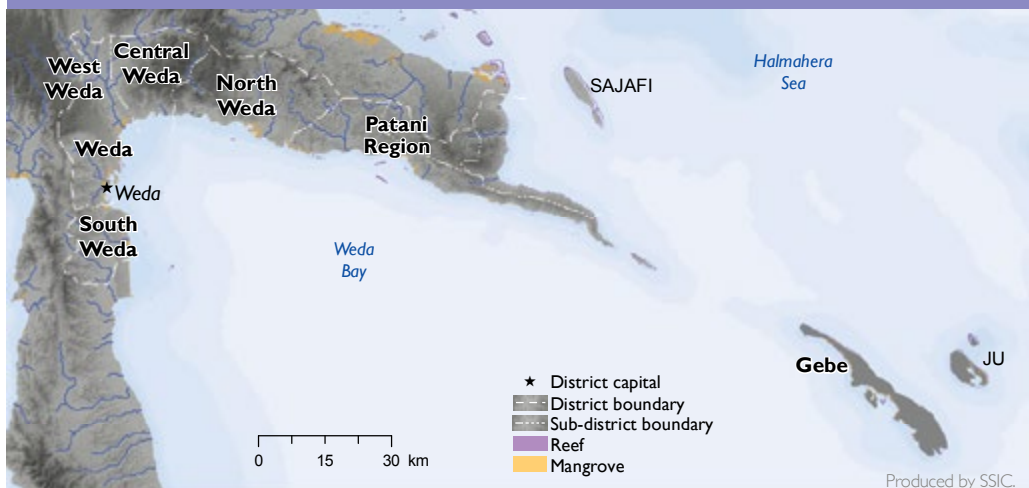
¹ Key mangrove species found on Mare island are from the *Rhizophoraceae* and *Meliaceae* families, including *Rhizophora mucronata*, *Bruguiera gymnorrhiza*, *Ceriops decandra*, and *Xylocarpus granatum*. Seagrass species found are: *Cymodocea serrulata*, *Cymodocea rotundata*, *Syringodium isoetifolium*, *Enhalus acoroides*, and *Thalassia hemprichii*.

² Some key obstacles need to be overcome to develop sustainable marine tourism on the island, particularly with regard to local skill building to manage visitors and the availability of freshwater sources (currently depleted to the extent that only rain water can be used for drinking).

CENTRAL HALMAHERA



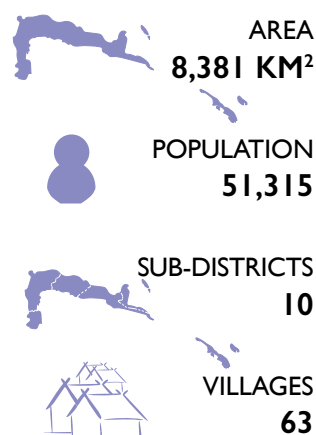
CENTRAL HALMAHERA



The Central Halmahera regency is located on the east of the Halmahera landmass. It has a population of more than 51,000 people. The regency is entirely coastal, consisting of 27 percent land and 73 percent ocean (BPS Kabupaten Halmahera Tengah, 2017).

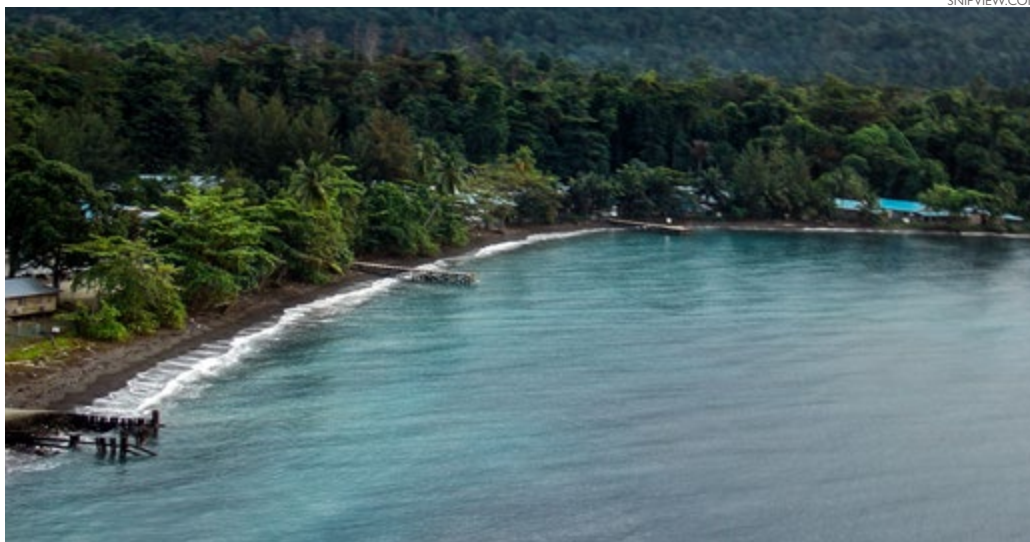
This area is host to a spectacular and largely unspoiled coastline, with mangrove forests and vibrant reefs that support the largely coastal population. Despite its allure, the remoteness of the area means it is rarely visited, with only 1,020 recorded visitors to the area in 2016 (66 percent domestic visitors and 34 percent international) (BPS Kabupaten Halmahera Tengah, 2017).

The regency is relatively poor, with nearly 14 percent of the population living under the poverty line for the area (i.e. living on less than 398,000 IDR/month) (BPS Kabupaten Halmahera Tengah, 2017). Central Halmahera is divided into ten sub-districts, with more than half of the population situated in the Weda sub-districts.



Source: BPS Kabupaten Halmahera Tengah, 2017.

SNIPVIEW.COM



WEDA SUB-DISTRICTS

The four key sub-districts of Weda, North Weda, South Weda, and Central Weda, are some of the key hubs for resident fishers and fleets.

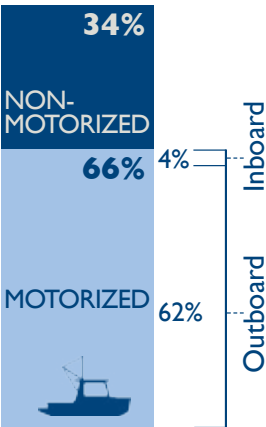
Across the 24 villages of this region, 675 fishers reside in 217 households. These fishers operate out of 530 vessels, approximately a third of which are non-motorized, whilst the vast majority of the remainder of the fleet are less than 10 GT and use outboard engines (Zuhdy, 2017).

The most common gear types used by these fishers are hand lines (463 units) and trolling lines (146 units), with other gears including encircling gill nets, surrounding nets with purse lines, beach seines, fish traps and spearguns (Retnoningtyas et al., 2017).

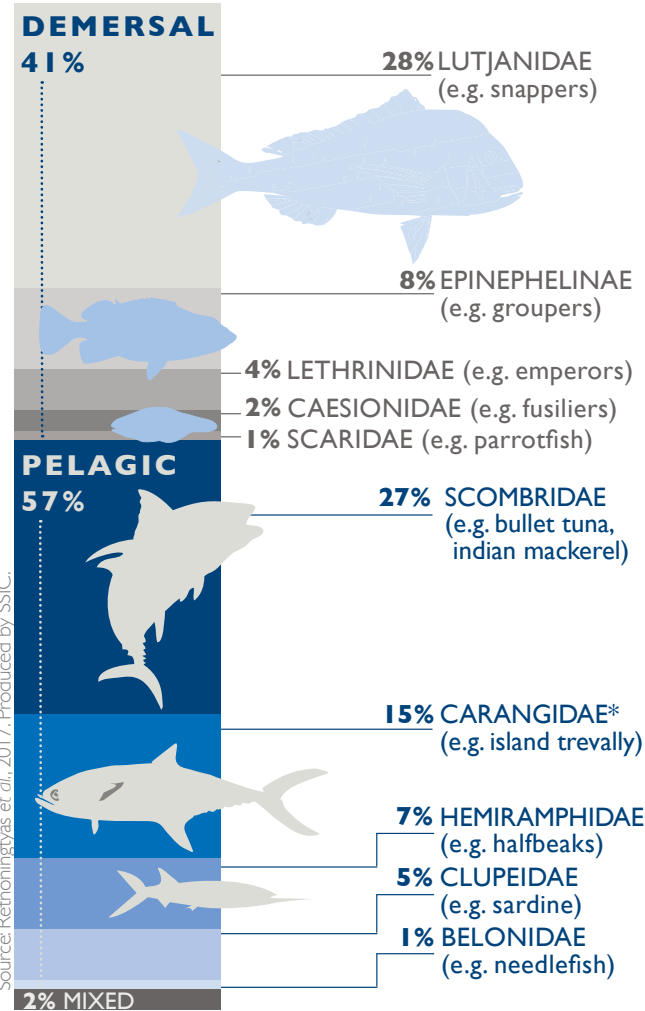
Fish catches in the region are dominated by snapper species (*Lutjanidae*)¹, with the ironjaw snapper (*Aphareus rutilans*) and crimson snapper (*Lutjanus erythropterus*) the most commonly caught of the nine main species found in the area. Large and small pelagic species are also commonly caught (from the families *Scombridae*, *Carangidae*, *Hemiramphidae*, and *Clupeidae*)² (Retnoningtyas et al., 2017).

The remainder of the catch is comprised of groupers (*Epinephelidae*), particularly the freckled hind (*Cephalopholis microprion*) and tomato hind (*C. sonnerati*); fusiliers (*Caesionidae*), including the dark-banded fusilier (*Pterocaesio tile*) and the double-lined fusilier (*P. digramma*); yellowtail snapper (*Caesio cuning*), and reef needlefish (*Strongylura incisa*) (Retnoningtyas et al., 2017).

WEDA’S FISHING FLEET



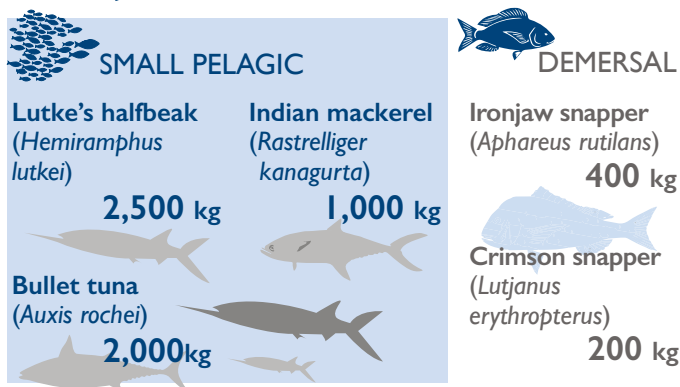
CATCH COMPOSITION IN WEDA, CENTRAL HALMAHERA



Source: Retnoningtyas et al. 2017. Produced by SSIC.

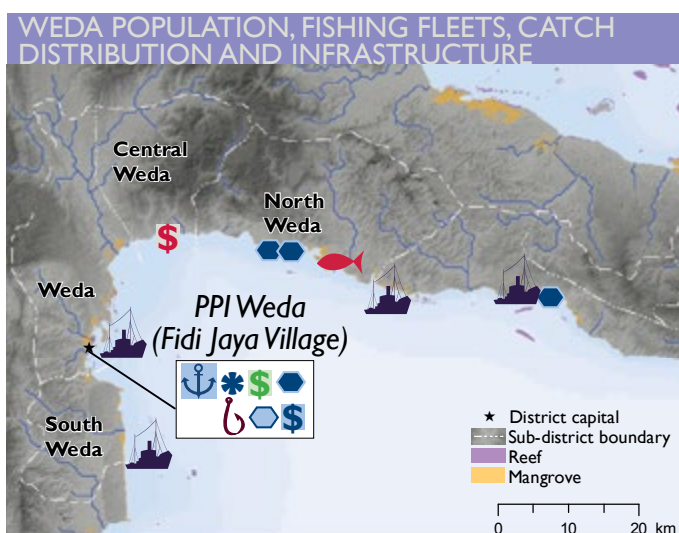
* This family can include both pelagic and demersal species; however, catch of Carangidae at Weda is dominated by pelagic variants of this family.

MAXIMUM CATCH VOLUME PER DAY: WEDA, CENTRAL HALMAHERA



* Catch figures shown are maximum yields (highest volumes) recorded from the region in one day. These figures do not reflect CPUE.

Source: Retnoningtyas et al., 2017. Produced by SSIC.



KEY FISHING FLEETS

> 25 vessels

KEY LANDINGS

> 2,900,000 kg / year

PORTS & JETTIES

1 large (vessels up to 10 GT)

GEAR REPAIR

1 repair center

MARKETS

1 active

1 inactive auction house

1 inactive

COLD STORAGE

1 active ice factory

PROCESSING

9 smoking & shredding units

1 seaweed shed

The highest concentrations of both fishers and vessel-landing activities can be found in North Weda and South Weda (Retnoningtyas et al., 2017).

Fishery infrastructure is centered in the fishing port of Weda PPI in the village of Fidi Jaya, where there is a jetty capable of berthing vessels up to 10 GT. This is also the site of the only ice factory in the region, and while it is in good operational condition, it simply does not have the capacity to meet the needs of the fishers in the area.

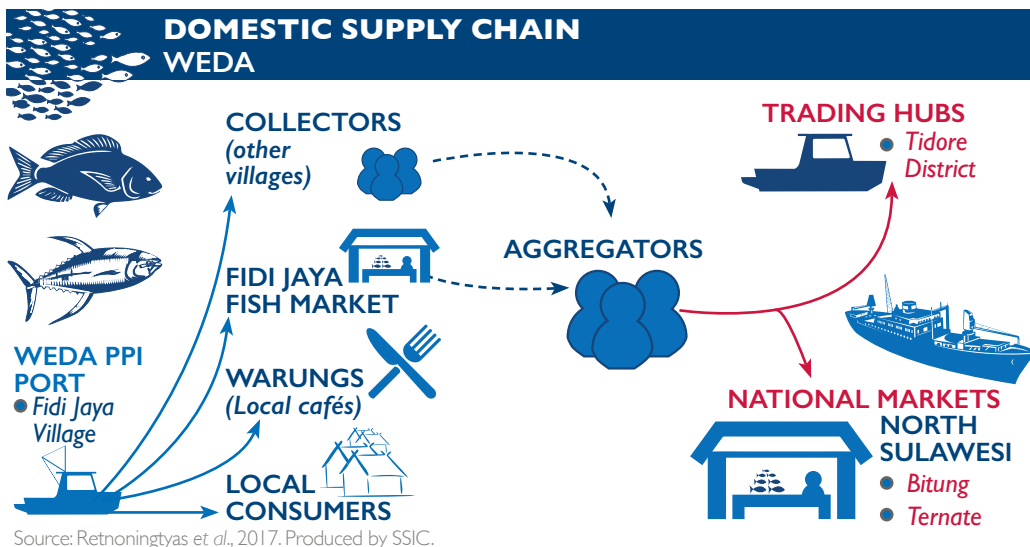
Weda PPI in Fidi Jaya village also has a disused fish auction house, which has been turned into a fishing gear repair center by local fishermen, and the village is host to the most active fish market in the region. Across the region, there are also nine small-scale (household-based) fish processing facilities, producing smoked fish and shredded fish (Retnoningtyas et al., 2017).



USAID SEA / IR TARMIDI

Previous page: coastal settlement in Central Halmahera

Right: trolling lines are the most common gear used by fishers in Weda



THE FISH OF FIDI

Given that most fish landings and trade take place through the Weda PPI port in Fidi Jaya village, this is the area that has been selected as a focus site for support through the USAID SEA Project. Fish landed in this area tend to be predominantly sold for local consumption by fishers or their families traveling door to door and to local cafés (*warungs*) in the village and neighboring villages. The remainder of the catch is traded at the Fidi Jaya village fish market to local fish collectors and aggregators.

Fish collectors are also located in several other villages in the region. They generally sell the products on to aggregators who then trade outside of the region, mostly through Oba in Tidore district and on to Ternate and Bitung in North Sulawesi (Retnoningtyas et al., 2017).

Several government groups to support fishers have been established over the years in the Weda sub-districts; however, many lacked representative engagement with target fishers, and none are active at the time of writing.

The fishers face a range of challenges, particularly related to infrastructure and facilities. The roads within the region are not in a good condition, resulting in delays in transportation and increasing the risk of product spoilage and wastage before reaching markets. This is exacerbated by the lack of ice-making facilities in some more remote parts of the region, compounded by an unstable electrical supply, meaning even home-produced ice is unreliable. In addition to this, the lack of an SPDN facility means that fishermen need to obtain fuel through retailers at an inflated price, adding considerably to overall operational costs and reducing profitability.

Right: mixed fish for sale at market in North Maluku

¹ Key snapper species include: the ironjaw snapper (*Aphareus rutilans*), deepwater red snapper (*Etelis carbunculus*), deep-water longtail red snapper (*Etelis coruscans*), mangrove red snapper (*Lutjanus argentimaculatus*), two-spot red snapper (*L. bohar*), Spanish flag snapper (*L. carponotatus*), crimson snapper (*L. erythropterus*), bigeye snapper (*L. lutjanus*) and malabar blood snapper (*L. malabaricus*).

² Key pelagic species include: bullet tuna (*Auxis rochei*), Indian mackerel (*Rastrelliger kanagurta*), Lutke's halfbeak (*Hemiramphus lutkei*), sardines (*Sardinella* spp.), and island trevally (*Carangoides orthogrammus*).

SUMMARY USAID SEA PROJECT SUPPORT

UNDERTAKING FISHERY ASSESSMENTS

Undertaking assessments for demersal and pelagic fisheries in the target locations. Utilizing an I-Fish compatible software to synchronize data management with the government fishery database.

STOCK
ASSESS

I-FISH

IMPLEMENTING FISHERY INTERVENTIONS

Contributing to the development of a fisheries management plan using EAFM, identifying fisher groups for trialing interventions, and assisting with the implementation of the plan.

INPUT &
OUTPUT
CONTROL

MARKETS

INCENTIVIZING SUSTAINABLE FISHERIES

Exploring opportunities to incentivize compliance with fisheries management interventions.

INVEST

MONITORING, EVALUATION & MANAGEMENT

Trialing small-scale fisher logbooks, promoting vessel registration (SIMKADA), and the establishment of a community surveillance group (*pokmaswas*) on the ground. Synchronizing work plans with wider agencies to effectively implement the one-stop service (PTSP).

LOG
BOOKS

VESSEL
REG

Key behavior changes anticipated:

- Increased recognition of the value of healthy marine resources for fishery livelihoods
- Willingness to engage in incentive mechanisms identified to support EAFM
- Willingness to comply with logbooks, vessel registration, and management interventions

for a full description
of these activities: see
volume two, chapter four

Target audiences: Fishers, collectors, aggregators, facility managers, government staff

Key capacity-building support areas provided:

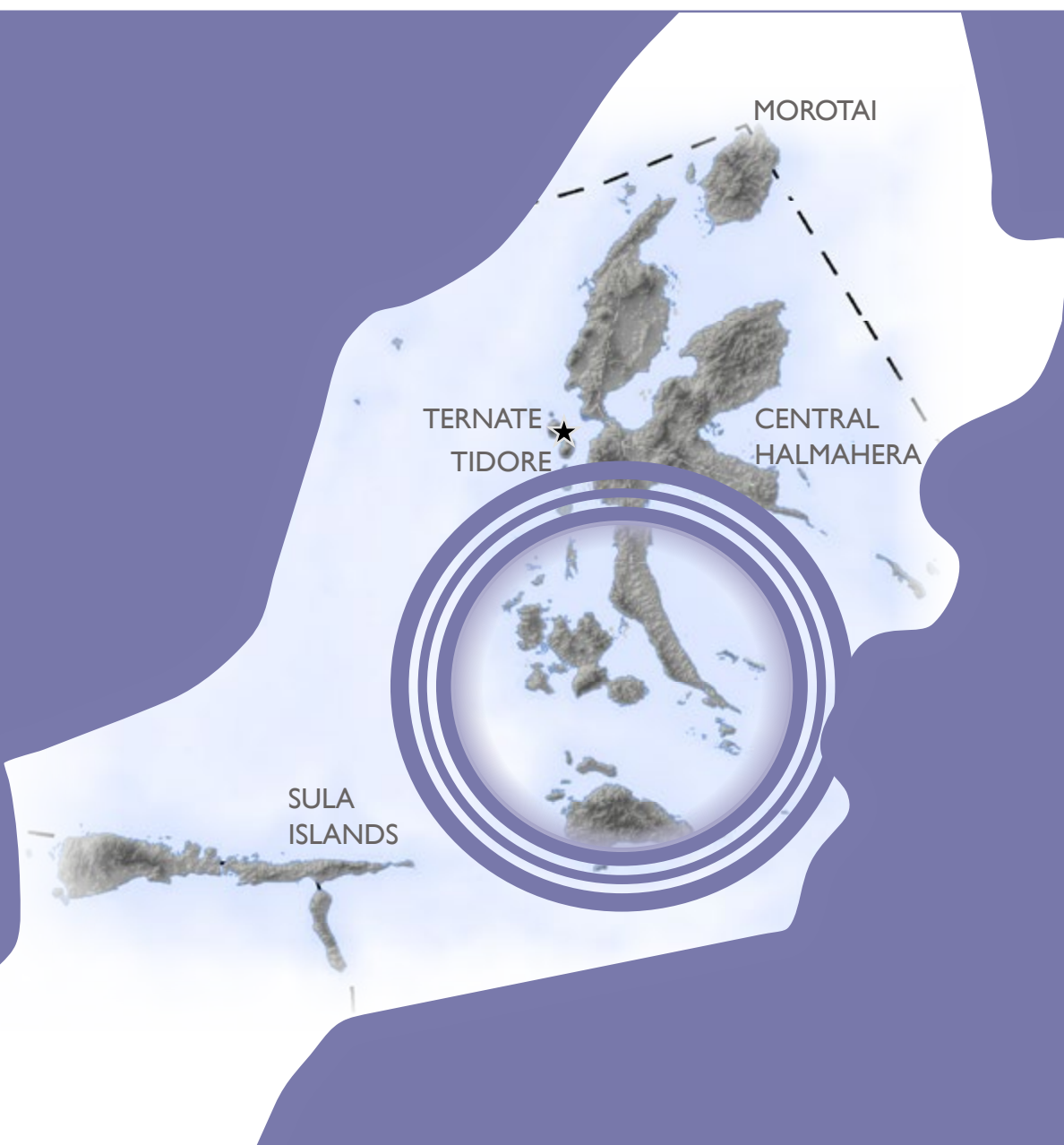
- Resource mapping and management planning
- Logbook usage and SIMKADA
- Sustainable fisheries management (including post-harvest management)

Target audiences: Fishers, collectors, aggregators, facility managers, government staff



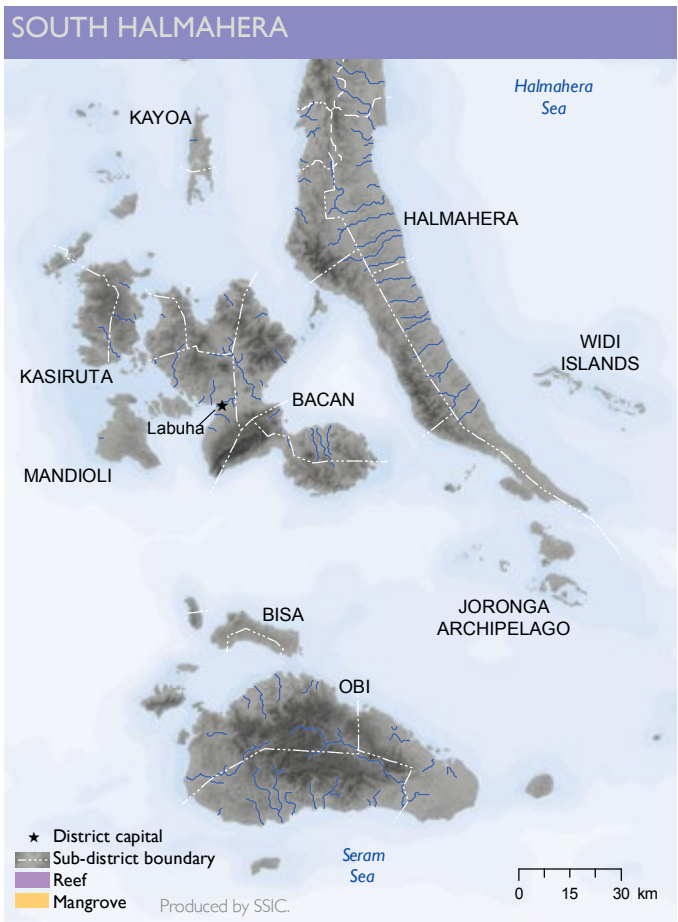
USAID SEA / I.R. TARMIDI

SOUTH HALMAHERA

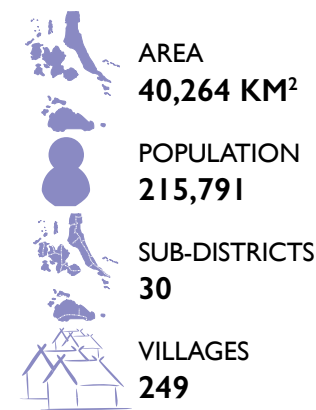


The South Halmahera regency covers a large area (> 40,000 km²), of which 22 percent is land (8,779 km²) and 78 percent ocean (31,484 km²). This vast regency is spread across seven main islands and two archipelagoes and is jurisdictionally divided into 30 sub-districts (BPS Kabupaten Halmahera Selatan, 2016).

In 2015, the population of the regency was 219,836, approximately 10 percent of which work as fishers, making sustainable fisheries management of this region particularly critical (BPS Kabupaten Halmahera Selatan, 2016). Overall fishery production from the region (measured through fish auctions and select landing sites) was 45,240.7 tons in 2015, though this is likely to be an under-representation of the overall volume of catch taken from these waters (BPS Kabupaten Halmahera Selatan, 2016).



Approximately six percent of the population of South Halmahera are living under the poverty line (on less than 220,000 IDR/month) (BPS Kabupaten Halmahera Selatan, 2016).



Source: BPS Kabupaten Halmahera Selatan, 2016.



Left: the rare walking shark is found in South Halmahera

THE CATCHES OF KAYOA

To the northwest of the regency lies the island of Kayoa, which is surrounded by several smaller islands and divided jurisdictionally into four sub-districts: Kayoa, West Kayoa, South Kayoa, and North Kayoa. They cover an area of approximately 177 km² and have a population of 21,647 people (BPS Kabupaten Halmahera Selatan, 2016).

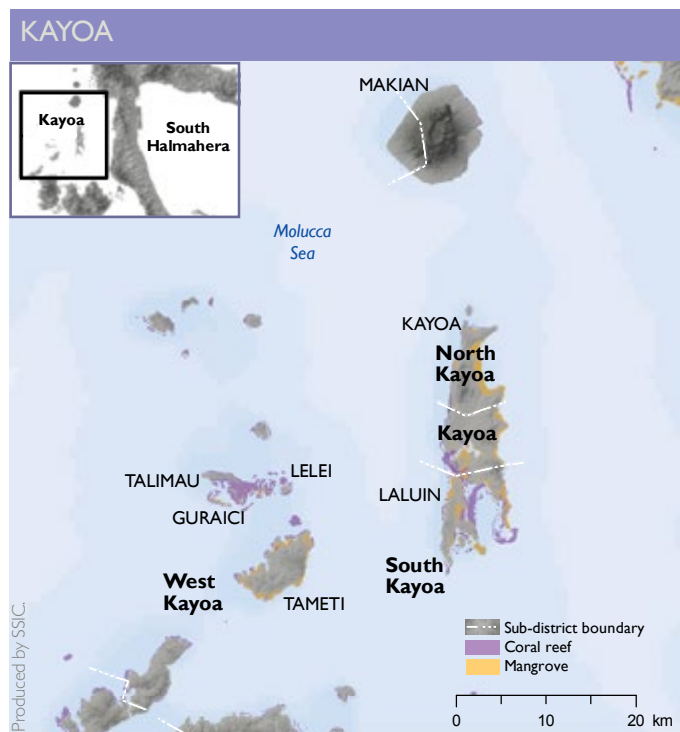
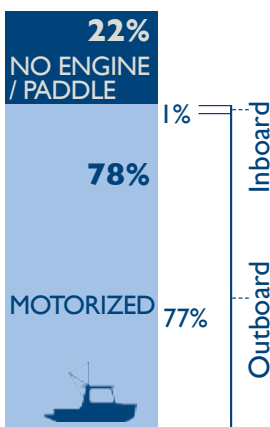
Kayoa island itself has been described as North Maluku's 'perfect island', due to its low population density, long stretches of white sandy beaches, crystal-clear waters, and vibrantly diverse marine biota (ITF, 2014). The area is home to several local migrant populations, including people of Makian, Galela, and Ternate ethnicities, as well as Kayoa peoples (WCS, 2016).

Tourism to the region has been fluctuating over the years. Cultural activities, such as the Guraici festival in Lelei village, have boosted visitor numbers on occasion; they have been supported by the Provincial Tourism and Culture Office of North Maluku through the development of 25 tourism cottages and the facilitation of 35 homestay residences in the community (Ishak and Herdiana, 2017; Lestari, 2017). However, today, many of these facilities are falling into disrepair as the festival is no longer held regularly. Nonetheless, considerable potential for the region exists, with exceptional manta ray dive tourism opportunities in Talimau Island and the chance to see the rare walking shark (*Hemiscyllium halmahera*) in Gunange Island.

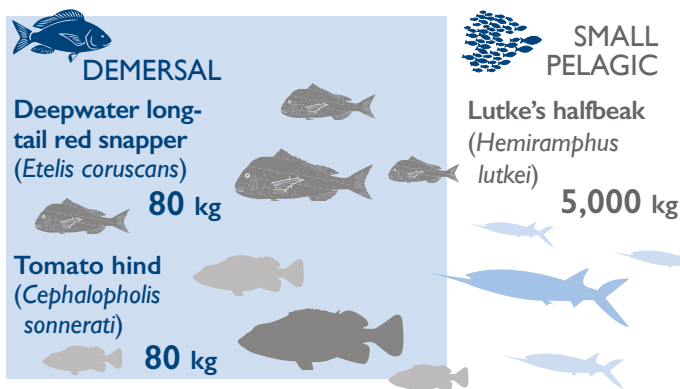
Approximately 14 percent of the archipelago's population are fishers (3,032 fishers across 1,661 households) (Retnoningtyas *et al.*, 2017), with an estimated 25 percent of these having fishing as their primary livelihood (BPS Kabupaten Halmahera Selatan, 2016). The Kayoa region contributes a significant proportion of South Halmahera's overall demersal fishery yield.

Fisher populations are concentrated in the areas of Laluin village, Posi-posi village, and Bajo village, with Lelei village and Talimau village also having significant fisher presence. Fleets, meanwhile, are mostly concentrated in the Bajo village area, with

KAYOA FISHING FLEET



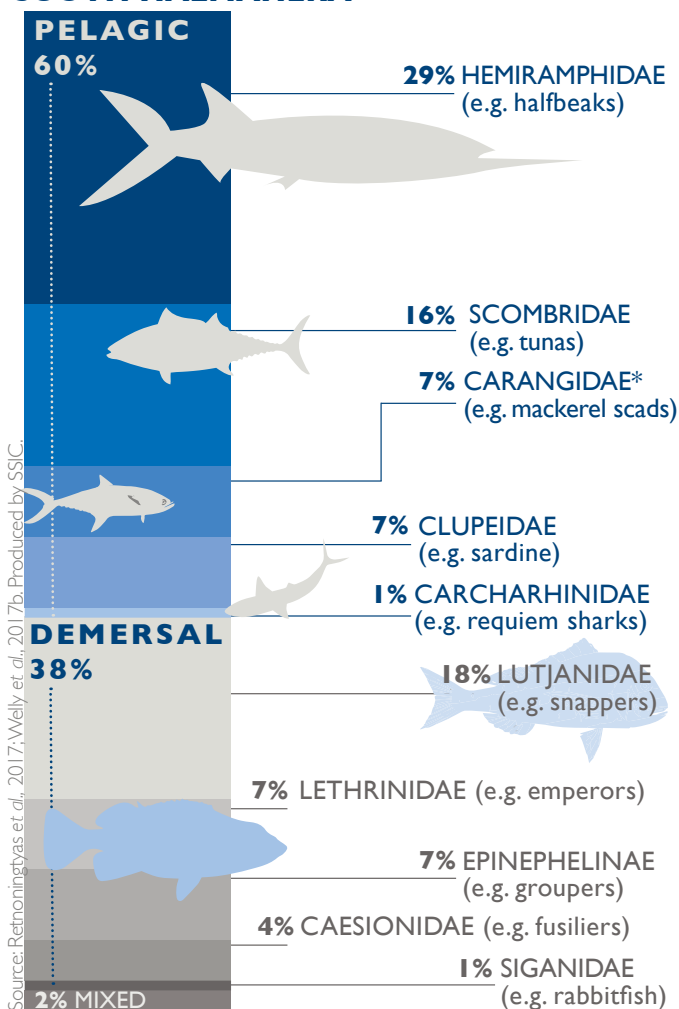
MAXIMUM CATCH VOLUME PER DAY: KAYOA, SOUTH HALMAHERA



* Catch figures shown are maximum yields (highest volumes) recorded from the region in one day. These figures do not reflect CPUE.

Source: Retnoningtyas et al., 2017. Produced by SSIC.

CATCH COMPOSITION IN KAYOA, SOUTH HALMAHERA



* This family can include both pelagic and demersal species; however, catch of *Carangidae* at Kayoa is dominated by pelagic variants of this family.

a total of 1,061 vessels recorded as active across the region (Retnoningtyas et al., 2017). The majority of vessels in the area are small vessels with outboard engines (Lestari, 2017).

Target catches include demersal and pelagic fish species. Demersal fisheries are dominated by snappers¹ and species from the *Lutjanidae* family, with the deepwater longtail red snapper one of the most commonly caught species. In addition to this, the demersal fisheries include emperors (particularly *Lethrinus obsoletus* and *L. ornatus*) and groupers² (*Epinephelidae*), especially the freckled hind (*Cephalopholis microprion*) and tomato hind (*C. sonnerati*). Other reef fish harvested in the area include members of the *Caesionidae* family, particularly *Caesio cuning*, *Pterocaesio tile*, and *P. digramma* species (Retnoningtyas et al., 2017).

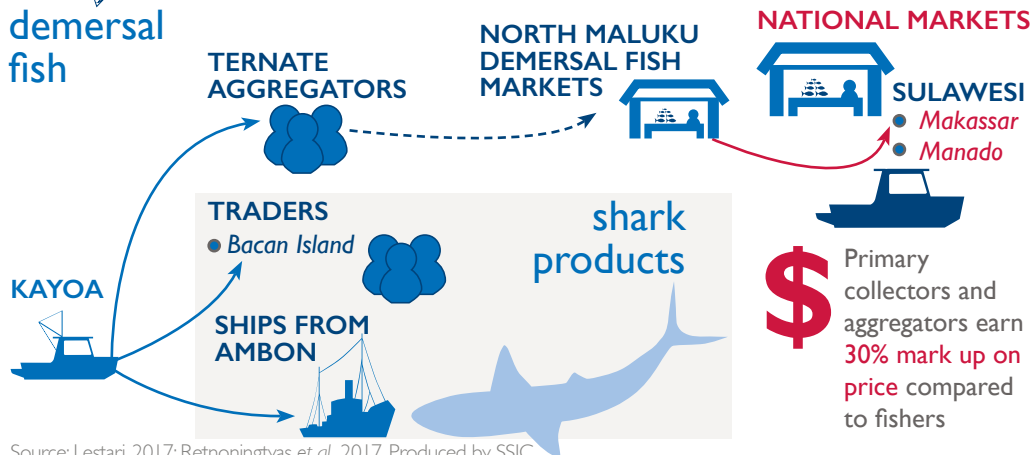
Meanwhile, pelagic catches in the region are dominated by small pelagics such as lutke's halfbeak (*Hemiramphus lutkei*), bullet tuna (*Auxis rochei*), and sardines (*Sardinella* spp.), while large pelagic species are generally dominated by skip-jack tuna (*Katsuwonus pelamis*) (Retnoningtyas et al., 2017).

Sharks are also caught in these waters, and shark-finning occurs in several areas. Fishers from Bajo village generally catch and fin sharks only when they are caught as bycatch, whereas fishers from Luluin and Posi-posi villages often target sharks for catch (Lestari, 2017; Retnoningtyas et al., 2017).



DOMESTIC SUPPLY CHAINS KAYOA

demersal
fish



Source: Lestari, 2017; Retnoningtyas et al., 2017. Produced by SSIC.

Demersal species are predominantly traded through Ternate and are a major contributor to demersal markets in North Maluku (indeed, the majority of all demersals traded through Ternate come from Kayoa). From here, they are often traded on to Manado and Makassar, with primary collectors and aggregators generally earning a 30 percent mark-up on price compared to the fishers (Lestari, 2017; Retnoningtyas et al., 2017).

Shark fins and associated shark products tend to be traded with ships from Ambon and with traders in Bacan Island (Lestari, 2017; Retnoningtyas et al., 2017).

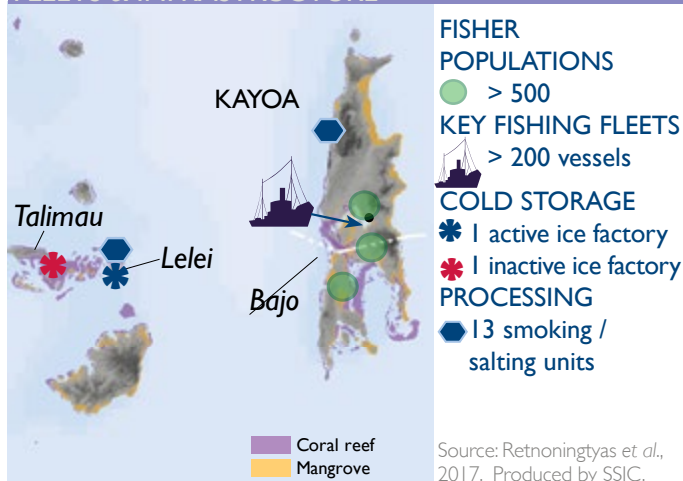
Throughout the Kayoa region, fishery infrastructure and facilities are extremely limited, often resulting in unnecessary levels of product spoilage and waste. Only one ice factory is in operation (in Lelei village), while another is present in Talimau village, but inactive at this time. Small-scale household-based ice production exists in some areas but is challenging due to unreliable and limited electrical supply to the area (only 6 to 12 hours/day).

In addition to this, there are no SPDN or APMS facilities, and many fishers rely on the support of collectors and trader groups (investors) to provide the operational costs for fishing and to facilitate onward trading (given the remoteness of the region). This reliance on investor support ties the fishers into indebtedness scenarios that limit the fishers' freedom to alter or adjust fishing practices (Retnoningtyas et al., 2017).

Twelve fish-processing facilities exist across the area that somewhat mitigate the challenge of managing fresh produce, but these are only small scale and household based, predominantly producing smoked fish and salted fish.

Other key challenges faced by the fishers of the region include outsider fishers from

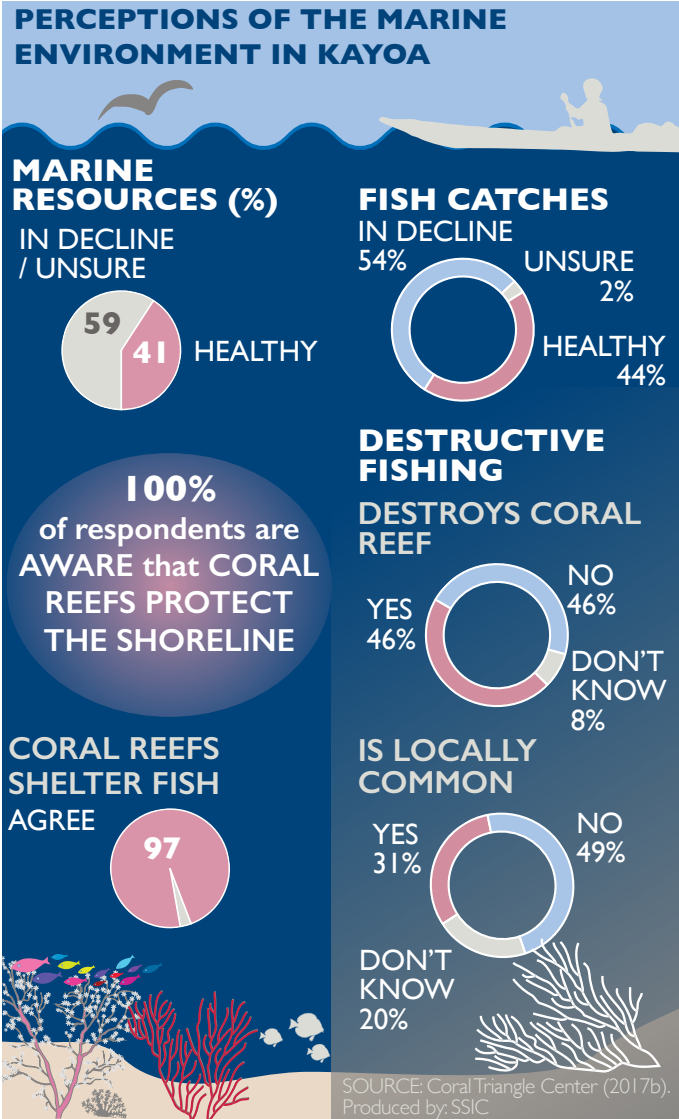
DISTRIBUTION OF FISHERS, FLEETS & INFRASTRUCTURE



Source: Retnoningtyas et al., 2017. Produced by SSIC.

West Halmahera conducting bomb fishing in the region, particularly on Fridays when most of the local Kayoa fishers are attending prayers. Such actions have led to considerable habitat destruction in some areas and to a perceived reduction in fishery productivity in the region. According to a perception monitoring survey conducted in 2017³, nearly 41 percent of participants from the region felt that some key fishery species they used to find in their waters were no longer present or were severely reduced in number⁴ (CTC, 2017b; Ishak and Herdiana, 2017; Lestari, 2017).

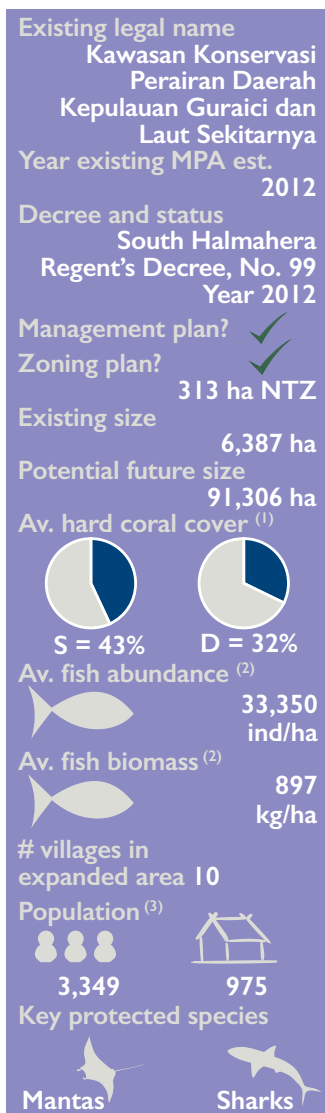
The same study revealed that, overall, there is a high level of awareness about the importance of coral reefs in Kayoa, but also a high level of despondency about the health of the resources, with nearly 50 percent of survey respondents feeling their marine resources are in a bad condition and the majority of people feeling that fish availability was greater in the past (CTC, 2017b).



To address some of these concerns, the government established the Guraici MPA in Kayoa in 2012. Situated across the waters of two key islands (Lelei and Guraici), this MPA covers an area of 6,386.64 ha and has been zoned to include approximately 313 ha of no-take areas. The MPA is one of the first in the region to graduate along the effective management rankings (entering level 2, MPA established) and has a management plan in place.

During the marine spatial planning process for the province (RZWP-3-K), Guraici MPA was identified as a priority area, and studies of the region indicate that expanding the MPA to cover more area could be beneficial, conferring greater protection to critical marine habitats and biota (including ETP species) and promoting maximal restocking of fishing grounds, crucial for local food security and livelihoods.

Therefore, in the draft RZWP-3-K, an area of 91,306 ha has been identified as potentially appropriate for expanded MPA coverage.

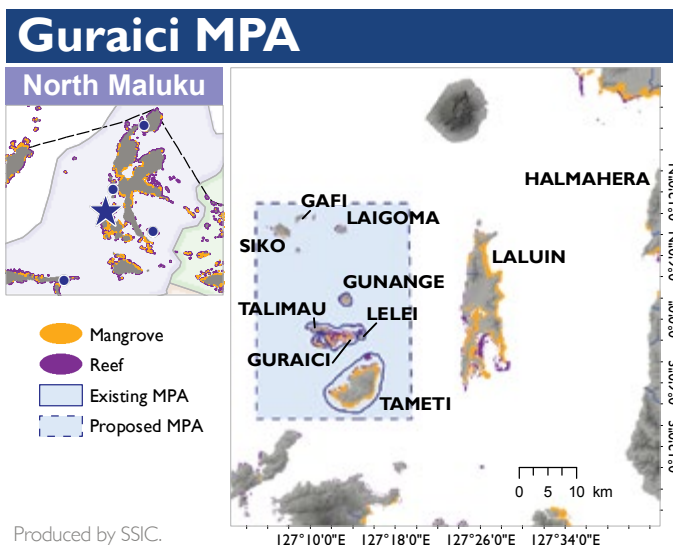


¹ Based on 50 m PIT x 3 replicates. S = shallow (< 4m), D = deep (10m). n = 14 sites (Retnoningtyas *et al.*, 2017).

² Based on UVC belt transects (50 x 5m), timed swims of 60 mins x 3 replications. Fish abundance ranged from lowest 11,696 ind/ha in Gafi to highest 68,250 ind/ha in Guraici.* Biomass ranged from lowest 316 kg/ha in Taneti to highest 3,044 kg/ha in Miskin (outside of the MPA).*

*Sites inside Guraici MPA were found to have significantly less coral cover and fish abundance ($P > 0.05$) compared to sites outside of the MPA ($n = 3$) (rounded data; Retnoningtyas *et al.*, 2017).

³ BPS, 2011.

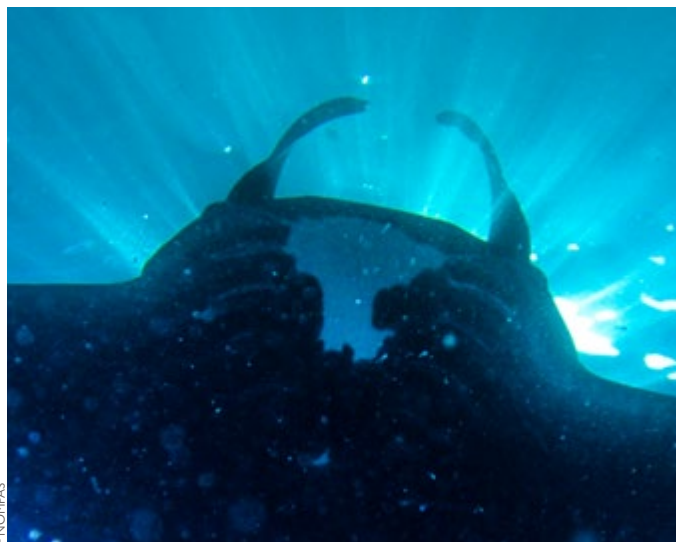


Current management effectiveness ranking: 100



The area identified for the potential expansion of Guraici MPA includes 143 different fishing grounds, several small islands, and 10 villages. Such an expansion will secure marine biodiversity and promote sustainable fisheries, as well as open opportunities for marine sustainable tourism activities in the area.

The USAID SEA Project is supporting zoning and management planning for this wider area as well as continuing the MPA's advancement along the effective management trajectory.



SUMMARY USAID SEA PROJECT SUPPORT

STEPS TO EFFECTIVE MPA MANAGEMENT SUPPORT (2016-2021)														
Level 1			Level 2				Level 3				Level 4			Level 5
MPA proposed	Inventory & area ID	Reservation of area	Management unit & personnel	Management & zoning plans	Facilities & infrastructure	Management funding	Plans approved	Management (SOPs)	Plans implementation	Designation (legal) of MPA	Boundary marking	Institutionalization	Resource management	Socioeconomics supported
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
														Independent MPA
														Optimally managed MPA
														Minimally managed MPA
														Established MPA
														Initialized MPA

Perceived importance of MPAs for local livelihoods



Perceived compliance with marine & coastal regulations



for a full description of the activities being implemented under each of these steps: see volume two, chapter three

Based on the results of a perception monitoring survey conducted in the area in 2017 (CTC, 2017b), there is already a strong awareness of the existence of Guraici MPA and recognition that protection of the area is important for livelihoods. However, the results also suggest that compliance with MPA regulations is low.

Therefore, **key behavior changes anticipated through this work:**

- Willingness to engage in expanded MPA design and planning
- Willingness to comply with MPA zoning, including no-take zones
- Adoption of sustainable tourism best practices for visitor management
- Willingness to comply with marine and coastal regulations

Target audiences: Fishers, collectors, community members

Key capacity building support areas provided:

- Resource mapping and management planning
- MPA management
- Sustainable fisheries management
- Sustainable tourism best practices

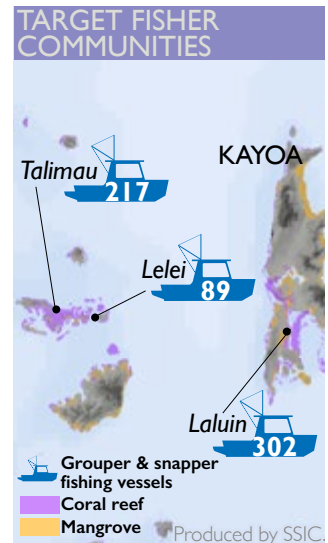
Target audiences: Management unit, community members, fishers

Left: manta rays are commonly seen in the waters of Guraici MPA
Below: Kayoa stakeholders completing a perception survey



CTC / Y. PUTRA

In addition to this, support is being targeted to three key demersal fishing communities in Kayoa: **Lelei** village and **Talimau** village (both situated within the potential boundaries of the expanded MPA area) and **Laluin** village (outside of the MPA). These communities were selected based on them having the highest concentrations of small-scale (< 10 GT) snapper and grouper fishers as well as a high level of dependency on these resources for livelihoods. In Lалуin village, more than 50 percent of residents are directly involved in fishing activities, and in Talimau, an average of 82 kg/trip of demersal species are harvested in peak season. There are also 10 collectors / investors located between these communities, making them critical to the local trading networks of the region.



CTC / Y PUTRA



SUMMARY USAID SEA PROJECT SUPPORT

UNDERTAKING FISHERY ASSESSMENTS

Undertaking assessments for demersal fisheries in the target locations. Utilizing an I-Fish compatible software to synchronize data management with the government fishery database.

STOCK
ASSESS

I-FISH

IMPLEMENTING FISHERY INTERVENTIONS

Contributing to the development of a fisheries management plan using EAFM, identifying fisher groups for trialing interventions, and assisting with the implementation of the plan.

INPUT &
OUTPUT
CONTROL

MARKETS

INCENTIVIZING SUSTAINABLE FISHERIES

Exploring opportunities to incentivize compliance with fisheries management interventions.

INVEST

MONITORING, EVALUATION & MANAGEMENT

Trialing small-scale fisher logbooks, promoting vessel registration (SIMKADA), and the establishment of a community surveillance group (*pokmaswas*) on the ground.

LOG
BOOKS

VESSEL
REG

for a full description of these activities: see volume two, chapter four

Based on the results of the 2017 survey, there is already a willingness on the part of these communities to more proactively engage in fisheries management. However, willingness to avoid using destructive practices was not universal (with 18 percent of respondents admitting they would likely continue to use destructive methods), and willingness to report violations was wavering (CTC, 2017b).

Commitment to report destructive practices



Commitment to avoid consuming juvenile fish



Commitment to avoid using destructive practices



Commitment to avoid consuming ETP species



Therefore, key behavior changes anticipated through this work:

- Greater awareness and willingness to stop destructive practices
- Willingness to comply with fishery regulations, complete logbooks, and register vessels
- Willingness to engage / participate in community surveillance

Target audiences: Fishers, community members

Key capacity-building support areas provided:

- Logbook usage and SIMKADA
- ETP species awareness
- Sustainable fisheries management (including post-harvest management)

Target audiences: Fishers, community members

Left: marine environment
of Guraici

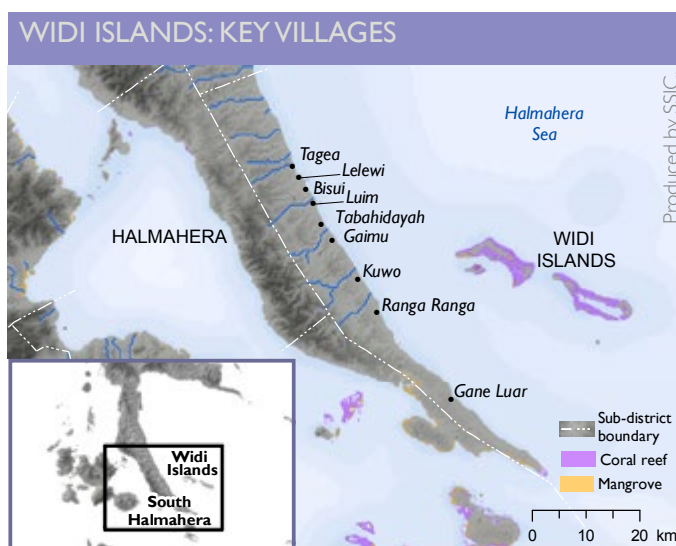


CTC

THE WONDERS OF WIDI

The Widi Islands are a group of 99 small, mostly uninhabited islands to the far east of South Halmahera regency. The area is remote (one hour by boat to the nearest point on the Halmahera landmass).

The islands have a predominantly low-lying landscape, just above sea-level, with the only permanent settlement located on Daga Island. However, fishers from nine villages on the mainland of South Halmahera frequent the area for fishing and set up temporary camps through the year (Lestari, 2017).



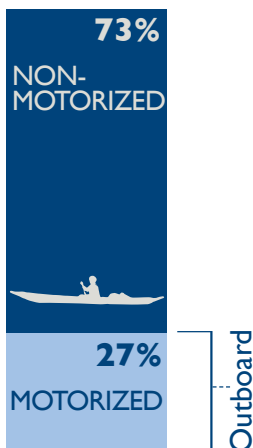
These villages have a combined population of 6,338 people, and approximately 26 percent of all households are engaged in fishing. Many of these communities have a long-held cultural belief in the mystical qualities of Widi. It has long been taboo to enter some inland areas of the islands, and it is forbidden to cut down the mangroves in the area, take, or kill animals (including the rare maleo bird that exists here). Any new or refurbished fishing vessels venturing to the islands are traditionally blessed through a *tumpeng* ceremony before setting sail (Lestari, 2017).

These traditional beliefs have contributed to the islands remaining a haven for both terrestrial and marine biodiversity, with extensive mangrove ecosystems and rich coral reefs. Today, the

● Above: non-motorized vessel in North Maluku

Above, right: demersal hand line

WIDI FISHING FLEET



WWF / ALBERTHO BAKARBESSY

islands are often referred to as the Maldives of Indonesia, with their clear turquoise waters and white sandy beaches, making them increasingly popular for more intrepid tourists (Saputro, 2018).

Fishers in the region operate predominantly in non-motorized vessels, fishing for demersal species using handlines. Target fish include snappers (particularly the humpback red snapper, *Lutjanus gibbus*), parrot fish (*Scaridae*), and groupers (particularly the red grouper, *Plectropomus leopardus*). Fishers camp on Widi for generally two to four weeks at a time, making temporary shelters from palm leaves and tarpaulins. Sometimes, fishers' wives will also go to the island to help with the salt processing and drying of the fish, as there are no cold storage options (Lestari, 2017).

For many of the fishers, camping on Widi islands is a way of life; they return to their home villages only to make preparations to once more return to Widi. Even in their home villages, infrastructure to support fishing is limited to the presence of three small jetties (in Kuwo, Ranga Ranga, and Bisui villages only) (Lestari, 2017; Muttaqin *et al.*, 2017).

In 2015, the beauty of these islands and their potential for tourism was recognized through the signing of a memorandum of understanding between the North Maluku provincial government and a private tourism company (PT Leadership Island Indonesia) to develop the region as a sustainable marine tourism destination, using environmentally-friendly principles (including the provision of solar photovoltaic electricity to the area). While these plans have not yet been implemented, they indicate the level of interest for this region emerging in recent years. In a similar vein, in October 2017, the biggest international fishing tournament in Indonesia was held in Widi under the title 'North Moluccas as a World Fishing Destination' (BIT, 2017). Hosting 350 international fish sporting enthusiasts competing for the President's Cup, the waters surrounding the islands were heavily fished in this period, with many large (and therefore highly fecund) snappers and groupers removed. In addition to this, plans are underway to establish permanent facilities for sport fishing, and 102 beach areas have been identified by the government as potential sites for development (Putri, 2017).


With these growing pressures on the area, it is imperative to ensure the marine and coastal resources of the islands are effectively managed to ensure sustainable fisheries management for local community livelihoods and protect the rich natural resources the region is depending upon for economic expansion.


In 2015, an MPA was established on these islands, covering an area of 7,690 ha, and since 2016, support has been underway to promote effective management of the area.

Legal name
Suaka Pulau Kecil
Halmahera Selatan

Year est.
2015


Decree and status
North Maluku
Governor's Decree No.
251/KPTS/MU/2015


Management plan? 


Zoning plan? (draft) 


Size
7,690 ha

Av. hard coral cover ⁽¹⁾


S = 48%



D = 46%


Av. fish abundance ⁽²⁾
 **33,550 ind/ha**

Av. fish biomass ⁽²⁾
 **1,874 kg/ha**

villages in MPA
0

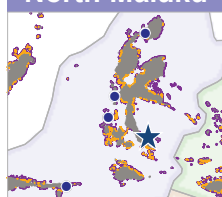
nearby villages utilizing MPA
9

Population ⁽³⁾
 **6,338**

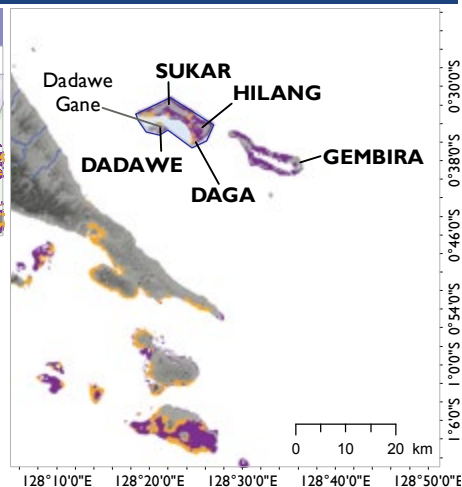
Key protected species

Turtles

Widi MPA

North Maluku



-  Mangrove
-  Reef
-  Existing MPA



Produced by SSIC.

Current management effectiveness ranking: 100



Under the original zoning plan for Widi MPA, 940 ha have been set aside as 'no-take', whilst 1,940 ha have been delineated for tourism and 480 ha for community use. In the coming years, key areas will be further explored to ensure sites with particularly high diversity are protected (such as Dadawe Gane site, where more than 70 percent hard coral cover has been observed). Management planning processes will also be supported and will consider issues of tourism development and deep-water marine management for sport fishing.

In addition to this, the area will be explored for potential expansion, as the draft North Maluku spatial plan (RZWP-3-K) allows for an area up to 324,961 ha to be potentially incorporated into an expanded MPA in the future.

¹ Based on 50m PIT x 3 replicates. S = shallow (3m), D = deep (10m). n = 11 sites. Substrates = 7 categories (Muttaqin et al., 2017).

² Based on UVC belt transects (50 x 5m), timed swims of 60 mins x 3 replications. Fish abundance ranged from lowest 22,460 ind/ha in Hilang to highest 52,553 ind/ha in Dadawe Veda. Biomass ranged from lowest 864 kg/ha in Hilang to highest 2,546 kg/ha in Dadawe Gane (rounded data; Muttaqin et al., 2017).

³ Muttaqin et al., 2017.



WWF / S K SARI

SUMMARY USAID SEA PROJECT SUPPORT

STEPS TO EFFECTIVE MPA MANAGEMENT SUPPORT (2016-2021)																		
Level 1			Level 2			Level 3			Level 4			Level 5						
MPA proposed	Inventory & area ID	Reservation of area	Management unit & personnel	Management & zoning plans	Facilities & infrastructure	Management funding	Plans approved	Management (SOPs)	Plans implementation	Designation (legal) of MPA	Boundary marking	Institutionalization	Resource management	Socioeconomics supported	Community welfare improved	Sustainable funding		
Achieved pre-USAID SEA Project support ⁽¹⁾			✓				✓	✓	✓	✓								

NOTES
(1) Currently achieved in Widi MPA, though would need to be readjusted should future expansion of the site take place.

Key behavior changes anticipated:

- Willingness to protect key areas related to community fisheries and sustainable marine tourism
- Willingness to establish and comply with MPA restrictions and/or management for sport fishing
- Willingness to comply with MPA zoning, including no-take zones
- Adoption of sustainable tourism best practices for visitor management

Target audiences: Tourism and sport fishing operators, communities, fishers, government

Key capacity-building support areas provided:

- Resource mapping and management planning
- MPA management
- Sustainable fisheries management
- Sustainable tourism best practices

Target audiences: Tourism and sport fishing operators, communities, fishers, government

for a full description of the activities being implemented under each of these steps: see volume two, chapter three

Below, left: Widi MPA provides critical habitat for turtles
Below: healthy hard coral marine environment



Y PAGASTUTI

THE OCEANS OF OBI

The Obi Islands region is situated to the southwest of South Halmahera regency. The area includes the large island of Obi and the four main islands of Bisa, Tapat, Belangbelang, and Obilatu. The largest of these – **Pulau Bisa** – is situated to the northwest of the large Obi island and hosts seven villages: Madapolo Tengah, Madapolo Timur, Madapolo Barat, Waringi, Galala, Cap, and Lapanawa.

The name ‘*Bisa*’ is thought to derive from the Bahasa Indonesian word for ‘poison’, named after the high populations of poisonous snakes thought to reside on the island. The inhabitants of Bisa predominantly come from Sulawesi ethnicities, having migrated to the area in recent decades. Education levels on the island are low, with approximately 58 percent of population having not completed elementary school, and only 16 percent graduating senior high school (MDPI, 2017).

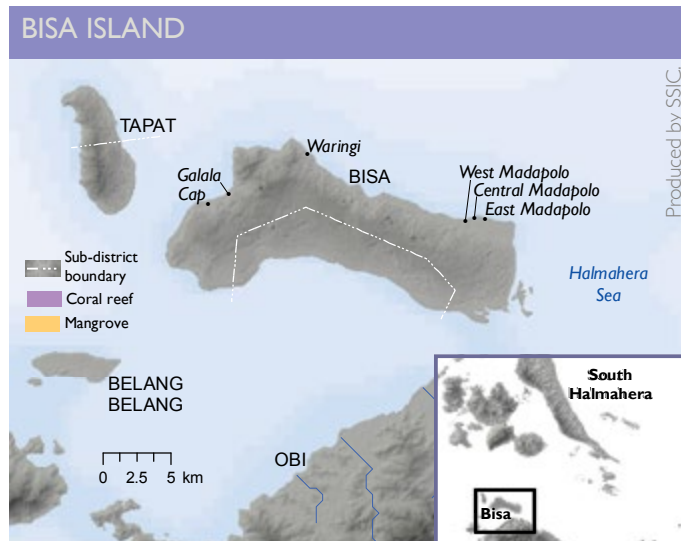
The most common livelihoods on the island are farming and fishing. Farmers generally have their own small land plots on which they cultivate cloves, nutmegs, cassava, and coconuts; in some areas, they raise livestock. Fishers tend to fall into two categories: artisanal reef fishers and tuna fishers (BPS Kabupaten Halmahera Selatan, 2017b; MDPI, 2017).

THE TUNA FISHERS OF BISA

Approximately 200 tuna fishing vessels operate out of Bisa Island, in small boats (<5 GT). Fishers generally use hand lines (145 units), with some fishers also deploying troll lines (51 units), bottom long lines (6), and gill nets (2). The target species are yellowfin tuna and skipjack tuna, with 70 percent of fishers targeting only these species, whilst the remainder of fishers will also take small pelagic and demersal species they may find (MDPI, 2017).

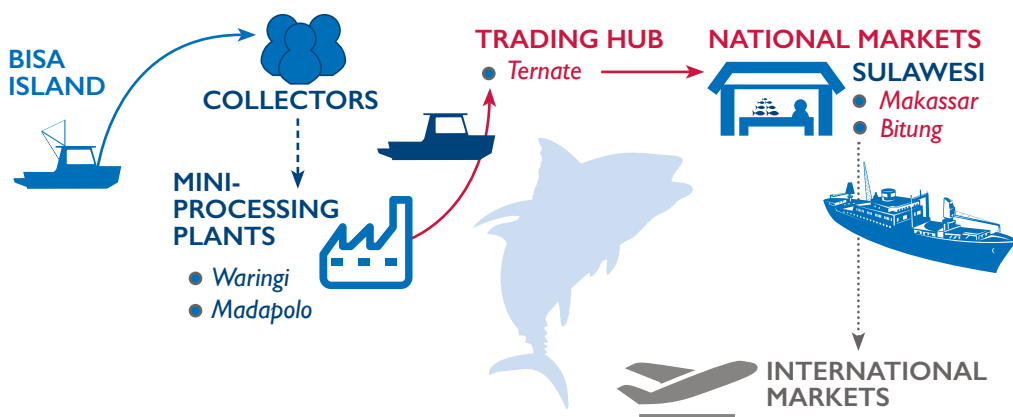
Two fish aggregation devices (FADs), established through shared financing between West Madapolo and East Madapolo communities, are located approximately 9 nm from the shoreline to attract pelagic species. The FADs support the capture of tuna and bait fish that are then sold on to the larger pole and line tuna fisheries. One fishing trip can cost up to 300,000 IDR in operational costs and can yield anywhere between 20 and 200 kg/trip.

Tuna catches are generally landed on beaches or near buying stations, with ice for short-term storage supplied from home freezers. The catches are generally sold to collectors (locally known as *jibu-jibu*), who are often associated with small mini-plants for primary processing. There are





TUNA SUPPLY CHAIN BISA ISLAND, OBI



Source: Kochen, 2017; Mardiani, 2017; MDPI, 2017. Produced by SSIC.

five mini-plants across the villages of Madapolo and one plant in Waringi village. Aside from these mini-plants, however, fishery infrastructure is very limited, making immediate sale of catches imperative for the fishers (Kochen, 2017; MDPI, 2017).

The fish are then traded on, usually through Ternate and on to Bitung in North Sulawesi and Makassar in South Sulawesi, where they are then traded both to large domestic markets and internationally (Mardiani, 2017; MDPI, 2017).

Unfortunately, the fishery is not without challenges. Outsider fishers have been increasingly observed in the local fishing grounds, using large nets to catch tuna. These vessels are coming from North Sulawesi and are creating what local fishers consider to be unfair competition against their smaller-scale hand line operations. This situation has been causing unrest in the region, with the potential to escalate into conflict (Kochen, 2017; Mardiani, 2017).

In addition to this, the use of old-fashioned hook and line gears are resulting in 90 percent of fishers periodically landing ETP species in their catches, including sharks, turtles, manta rays, dolphins, Napoleon fish, dugongs, and even whales. Furthermore, marine and coastal integrity is undermined locally, as corals are mined to provide construction material for houses, and mangroves are harvested for firewood and building material (Kochen, 2017).

Therefore, the tuna fishery of Bisa is at a critical juncture, where sustainable marine resource management is essential to secure both the future livelihoods of the local communities and to preserve the essential marine biodiversity of the region that underpins those livelihoods.



Right: processing plant typical of the South Halmahera region

BRINGING FAIRTRADE TO BISA

Fair Trade is both a concept and a brand through which the primary providers of commodities (i.e. farmers, fishers) commit to ensuring their products are sustainably managed / sourced in exchange for earning a fair and reliable market price. End-line consumers meanwhile pay a premium for the sustainably-managed products in recognition of fair pricing and as their own contribution to a more equitable world.

In 2014, the Maluku handline tuna fishery became the first in Indonesia to be Fair Trade certified at entry level, and today the world's first Fair Trade certified seafood is available in more than 1,000 stores in the USA as well as many restaurant outlets sourcing from the Fair Trade label.

In July 2017, the fishers of Bisa committed to engaging with Fair Trade, and the Bisa Fair Trade Program for yellowfin tuna was launched. In the coming years, a great deal of work will be required in order to achieve full certification, which will include addressing the sustainability challenges faced by this fishery.

Initial steps (to date) have included (Kochen, 2017):

- socializing the concept of Fair Trade with all key actors in the Bisa supply chain (fishers, collectors, processors, distributors, and exporters) and associated stakeholders (village heads, communities, and government agencies)
- developing fisher associations (one per community or collector) and establishing clear internal association management mechanisms
- establishing a Fair Trade committee for Bisa, with representation from each association to oversee related activities.



In addition to this, a needs assessment has been conducted (following approved Fair Trade criteria), including an assessment of the processing facilities (to identify the gaps to address in order to meet Fair Trade standards), and investigations into the supply chain are underway. Understanding all elements of the supply chain is critical for developing a clear chain of custody (CoC) for the traded tuna as a key requirement for Fair Trade (Kochen, 2017; MDPI, 2017). The process for accreditation also requires considerable training, and to date the fisher associations have received:

- safety at sea training, conducted with resource persons from Indonesia's National Search and Rescue Agency (*Badan Search and Rescue Nasional – BASARNAS*)
- tuna handling training (with Anova export company) to maximize product viability and reduce wastage

WHAT ARE CIRCLE HOOKS?

These hooks are circular in design, rather than the traditional 'J' shape of most fishing hooks. Their design means they are far less likely to be swallowed by turtles (which can cause suffocation or internal bleeding). Field trials have shown that circle hooks can reduce marine turtle deaths by as much as 90 percent (Bolton and Bjorndal, 2005; Watson *et al.*, 2005).



DEPOSITPHOTOS.COM

- an introduction to circle hooks that help avoid the accidental capture of ETP species (particularly turtles) and training on the use of an ETP logbook to capture data on accidental catches and promote greater awareness.

Moving forward, support will continue to be provided to the multifarious elements required for achieving Fair Trade certification (Kochen, 2017; MDPI, 2017).

SUMMARY OF USAID SEA PROJECT SUPPORT

UNDERTAKING FISHERY ASSESSMENTS

Undertaking assessments of stock, vessel activity, CoC and related elements necessary for acquiring Fair Trade certification. Utilizing the I-Fish database to synchronize data management with the government fishery database. Installing Spot Trace devices on vessels to track and study vessel activities.

STOCK
ASSESS

I-FISH

IMPLEMENTING FISHERY INTERVENTIONS

Exploring and implementing mechanisms for market-based adaptations to comply with Fair Trade standards.

MARKETS

INCENTIVIZING SUSTAINABLE FISHERIES

Promoting Fair Trade certification as an incentive for long-term sustainable fisheries management.

INVEST

MONITORING, EVALUATION & MANAGEMENT

Trialing, assessing and adapting fisher logbooks for improved data availability; promoting vessel registration (SIMKADA) and fisher ID cards; and promoting the registration of FADs.

LOG
BOOKS

VESSEL
REG

FISHER
CARDS

FAD
REG

for a full description of these activities: see volume two, chapter four

Key behavior changes anticipated:

- Adoption of data tracking measures (logbooks, CoC processes) in compliance with Fair Trade requirements
- Understanding about, and potential adoption of circle hooks for reduced bycatch and injury of ETP species
- Increased recognition of the value of healthy marine resources for livelihoods
- Willingness to comply with Fair Trade restrictions and requirements

Target audiences: Fishers, collectors, processors, distributors, exporters, government agencies

Key capacity-building support areas provided:

- Sustainable fisheries management
- Logbook and associated monitoring activities
- CoC processes and associated documentation requirements
- Tuna handling and gear deployments for sustainable management

Target audiences: Fishers, collectors, processors, distributors, exporters, government agencies

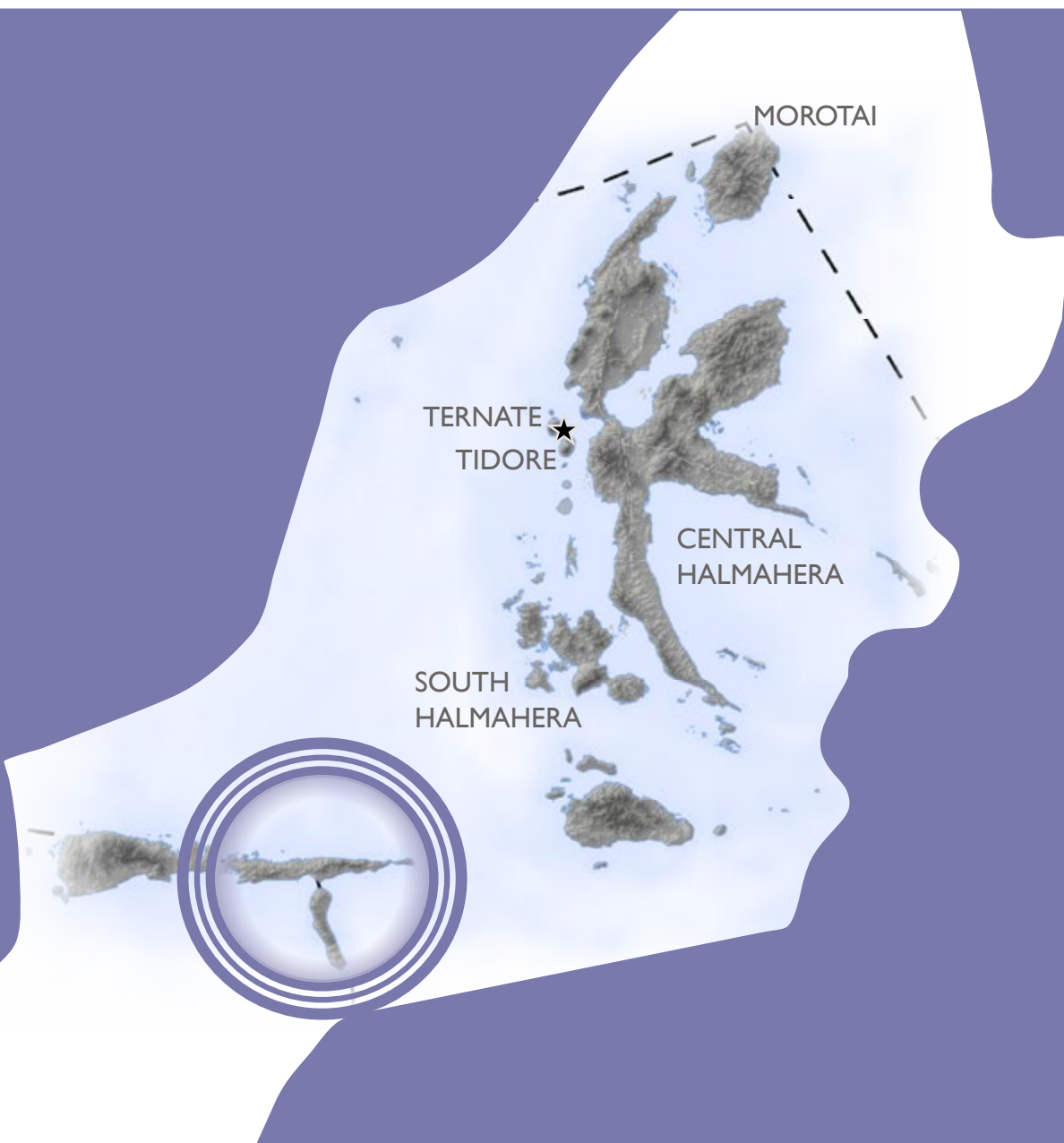
¹ Key snapper species targeted in Kayoa include: *Aphareus rutilans*, *Aprion virescens*, *Etelis carbunculus*, *E. coruscans*, *Lutjanus bohar*, *L. erythropterus*, *L. fulvivflamma*, *L. malabaricus*, *L. rivulatus*, *L. vitta*, *Paracaesio kusakarii*, and *Pinjalo lewisi*.

² Key grouper species targeted in kayoa include: *Cephalopholis microprion*, *C. miniate*, *C. sonnerati*, *Cromileptes altivelis*, *Epinephelus fuscoguttatus*, *Variola albimarginata*, and *Cypselurus poecilopterus*.

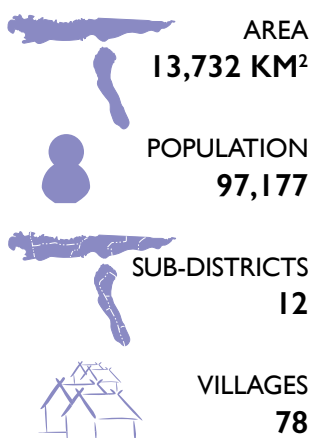
³ Stakeholder respondents in perception monitoring (Kayoa): total = 39. Fisherman (n = 10), civil servants (n = 17), unemployed (n = 1), other (private sector, part time / contract workers, teachers, and seasonal fishers) (n = 11). 79 percent male, 21 percent female. The majority (51 percent) earn between 1 and 5 million IDR/month. Note: the scale of the study only provides an insight into perceptions and does not represent the entire area in a statistically robust fashion.

⁴ Key species noted as absent or reduced in number in Kayoa waters in recent years: hairfin anchovy (*Thrissina baelama*), Indian anchovy (*Stolephorus indicus*), Napoleon wrasse (*Cheilinus undulatus*), chocolate grouper (*Epinephelus pachycen-trum*), deep pugnose ponyfish (*Secutor ruconius*) and a range of snappers (*Lutjanus* sp.).

SULA ISLANDS



SULA ISLANDS



Source: BPS Kabupaten Kepulauan Sula, 2017.



The Sula Islands are in the far southwest of North Maluku. They consist of three large islands (Mangoli, Sulabesi, and Lifmatola) and 19 smaller islands. The regency covers an area of 13,732.7 km² (52 percent land, 48 percent ocean) and is sub-divided into 12 sub-districts within which are 78 villages (BPS Kabupaten Kepulauan Sula, 2017; Welly et al., 2017a). The regency has an estimated total population of 97,177 people, with the highest concentration found in the main towns in Sanana and Mangoli Utara (BPS Kabupaten Kepulauan Sula, 2017).

Approximately 10 percent of the population in this region live below the poverty line, with investments in the area predominantly related to mining (coal, gold, and limestone). Tourism is still relatively small scale, but has been increasing in recent years, with the sub-district having a total of 19,200 visitors in 2015, nearly all of whom (95.5 percent) were domestic travelers. There is great potential for expanding this market, particularly for international visitors in the coming years, as the area boasts spectacular terrestrial and marine vistas, including clear-water lakes, waterfalls, white sandy beaches, and stunning reef and mangrove systems located around exotic small islands (BPS Kabupaten Kepulauan Sula, 2017; Welly et al., 2017a).

Based on studies conducted in the region in 2017, some reefs were found to have exceptional coral cover (up to 78 percent). The underwater environment here is also host to the rare walking shark (*Hemiscyllium halmahera*), dugong and a large population of turtles, particularly the critically endangered hawksbill turtle (*Eretmochelys imbricata*). During reef surveys, more than 40 turtles could be observed in just one trip (Welly et al., 2017a).

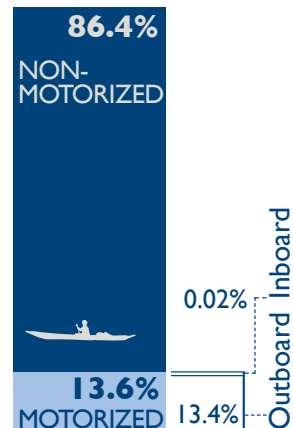
“We can see [turtles] all around the islands, swimming under the sea by daytime or lying their eggs in the sand by night.”

Syamsul Bahri, fishery extension officer



CTC / M. WELLY

SULA ISLANDS FISHING FLEET



Key livelihoods in the Sula Islands include mining and quarrying (employing nearly 30 percent of the region's workforce in 2015), farming, forestry, and fishing; with approximately 4,981 fishers resident in the area (BPS Kabupaten Kepulauan Sula, 2010).

The majority of these fishers operate out of non-motorized vessels, targeting small and large pelagics¹, predominantly tuna and skipjack tuna, as well as demersal species², particularly snapper and grouper (BPS Kabupaten Kepulauan Sula, 2017; Welly *et al.*, 2017a).

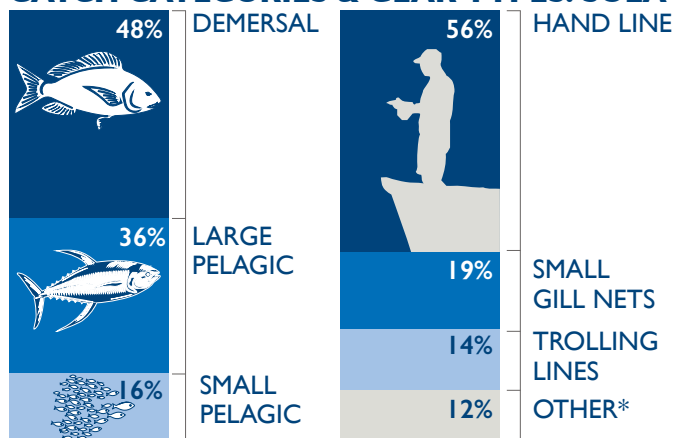
The most common gear types used in the region are hand lines, followed by trolling lines and mini purse seines, with the majority of fishers (63 percent) fishing within 3 nm of the shore.

The majority of these fishers are artisanal, selling their catches locally to the domestic market and earning an average of approximately IDR 1.4 million per month. This income is often insufficient for regular needs. With households spending an average of IDR 887,000 on children's education, this expenditure alone costs more than half of the income available. Such challenges may be the cause of nearly 40 percent of children not enrolling in senior high school and instead entering the workforce at a young age.

Other challenges faced by these fishers include lack of access to financing or loans, making any issues, such as boat repairs, often difficult to finance, resulting in bankruptcy for some fishers. The remoteness of the area limits access to wider markets, and the lack of fishery infrastructure limits expansion of operations.

In addition to this, the pressure on natural resources is steadily increasing. In surveys conducted in 2017³, 58 percent of stakeholders from

CATCH CATEGORIES & GEAR TYPES: SULA



Other gear types: mini purse seines (4%), traps (3%), long lines (1%), shore fences and weirs (2%), spearguns (1%), compressor fishing (1%).

Source: Welly *et al.*, 2017. Produced by SSIC.

PERCEPTIONS OF THE MARINE ENVIRONMENT IN SULA ISLANDS

MARINE RESOURCES (%)

HEALTHY



FISH CATCHES

IN DECLINE



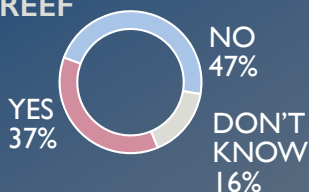
CORAL REEFS PROTECT THE SHORELINE

AGREE



DESTRUCTIVE FISHING

DESTROYS CORAL REEF

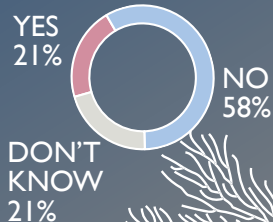


CORAL REEFS SHELTER FISH

AGREE



IS LOCALLY COMMON



SOURCE: Coral Triangle Center (2017b).
Produced by: SSIC.

the region felt that the availability of fish had decreased in recent years⁴. Also, the consumption of turtle eggs is still prevalent across the region, though they are not used as a saleable commodity.

Finally, the surveys found that, whilst awareness is high regarding the importance of coral reefs for fish breeding and shoreline protection, nearly half of all stakeholders interviewed (47 percent) are not aware of the damage to coral reefs that can be caused by destructive fishing practices, and few are aware of the laws regarding ETP species.

“We thought that the government only forbids us from hunting the turtles, but not from collecting their eggs. We didn’t know about it.”

Fadli Makian, local fisherman

Therefore, in order to secure the natural resources of the region for both sustainable fisheries and potential tourism expansion, as well as protect the extraordinary natural heritage and rare species of the region, the Sula Islands have been identified by the provincial government as a priority site for the establishment of a marine protected area. This MPA would be designed to support local community livelihoods and food security as well as promote the potential diversification of livelihoods and income generation.



Previous page: Lifmatola and Mangole Islands

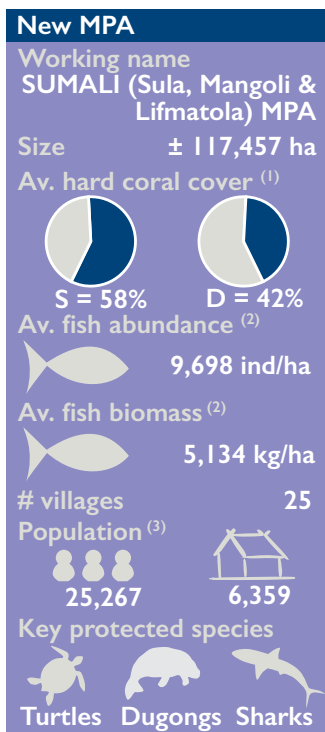
Above, left: hand line fisherman in Sula Islands

¹ Key target pelagic families: *Scombridae*, *Carangidae*

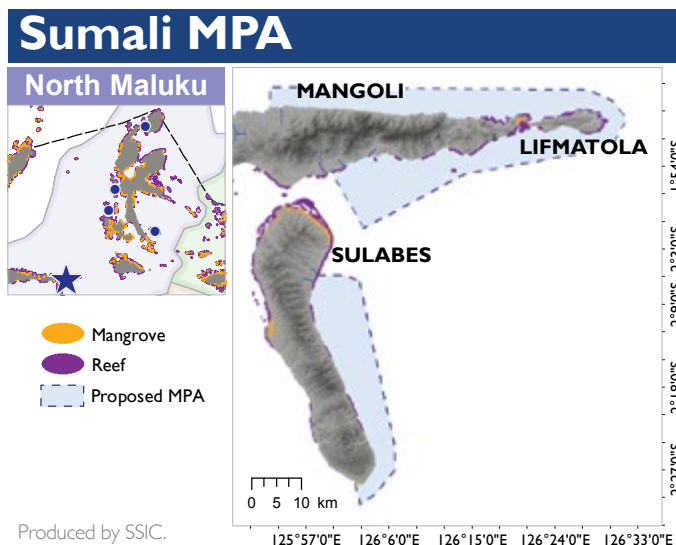
² Key target demersal families: *Caesionidae*, *Lethrinidae*, *Lutjanidae*, *Scaridae*, *Acanthuridae*, *Haemulidae*, *Serranidae*, *Mullidae*, and *Siganidae*

³ Stakeholders interviewed totaled 38 people: fishermen (n = 14), civil servants (n = 12), unemployed (n = 1), other (private sector, part time / contract workers, teachers, and seasonal fishers) (n = 11). 74 percent male, 26 percent female. The majority (58 percent) earn less than 1 million IDR/month. Note: scale of study only provides an insight into perceptions and does not represent the entire area in a statistically robust fashion.

⁴ Key species considered reduced in Sula’s waters in recent years: Indian anchovy (*Stolephorus indicus*), Napoleon wrasse (*Cheilinus undulatus*), hound needlefish (*Tylosurus crocodilus*), chocolate grouper (*Epinephelus pachycentrum*) and milkfish (*Chanos chanos*) as well as a range of rabbitfish (*Siganus* sp.) snappers (*Lutjanus* sp.), stingrays (*Dasyatis* sp.) and emperors (*Lethrinus* sp.).



- ¹ Based on 50m PIT x 3 replicates. S = shallow (< 4m), D = deep (10m). n = 13 sites. Substrates = 7 categories (Welly et al., 2017a).
- ² Based on UVC belt transects (50 x 5m), timed swims of 20 mins (equal to 400 m). Fish abundance ranged from lowest 2,496 ind/ha in Tanjung Waka to highest 19,348 ind/ha in Lifmatola Penyu. Biomass ranged from lowest 1,771 kg/ha in Tanjung Waka to highest 9,217 kg/ha in Lifmatola Penyu (rounded data; Welly et al., 2017a).
- ³ BPS, 2011.



Current management effectiveness ranking: 0



Under the North Maluku draft spatial plan (RZWP-3-K), up to 117,457 ha have been identified as the potential area for the Sula, Mangoli, and Lifmatola (SUMALI) MPA. Separated into two parts, the MPA is anticipated to envelope the northern, eastern, and southern marine areas of eastern Mangoli Island, the waters of Lifmatola Island, and the eastern coast of Sulabes. This would secure key reef and mangrove habitat as well as turtle forage and nesting areas.

At the time of writing, initial manta tow (level 1) surveys have been conducted, and the MPA is on the way to becoming formally delineated and reserved.



Right: turtle nesting site survey in Sula Islands

Far right: green turtle at Lifmatola Island



SUMMARY USAID SEA PROJECT SUPPORT

STEPS TO EFFECTIVE MPA MANAGEMENT SUPPORT (2016-2021)														
Level 1			Level 2				Level 3				Level 4			Level 5
MPA proposed	Inventory & area ID	Reservation of area	Management unit & personnel	Management & zoning plans	Facilities & infrastructure	Management funding	Plans approved	Management (SOPs)	Plans implementation	Designation (legal) of MPA	Boundary marking	Institutionalization	Resource management	Socioeconomics supported
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
														Independent MPA
														Optimally managed MPA
														Minimally managed MPA
														Established MPA
														Initialized MPA

for a full description of the activities being implemented under each of these steps: see volume two, chapter three

The surveys undertaken in Sula revealed a relatively high level of awareness already present regarding the importance of having an MPA at the site, and just over 50 percent of those interviewed stated their willingness to report any destructive acts witnessed to the authorities.

At the same time, however, respondents felt that fishers generally do not comply with government regulations, suggesting that a critical component of MPA establishment will be the effective promotion of compliance and support for MPA regulations.

Other key behavior changes anticipated through this work:

- Willingness to engage in expanded MPA design and planning
- Willingness to comply with MPA zoning, including no-take zones
- Adoption of sustainable tourism best practices for visitor management

Target audiences: Fishers, community members, management unit

Key capacity-building support areas provided:

- Resource mapping and management planning
- MPA management
- Sustainable fisheries management
- Sustainable tourism best practices

Target audiences: Fishers, community members, management unit

Perceived importance of MPAs for local livelihoods



Perceived compliance with marine & coastal regulations



Commitment to report destructive acts



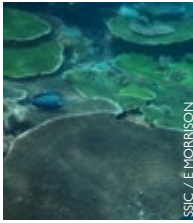
CTC/M. WELLY



CHAPTER 2

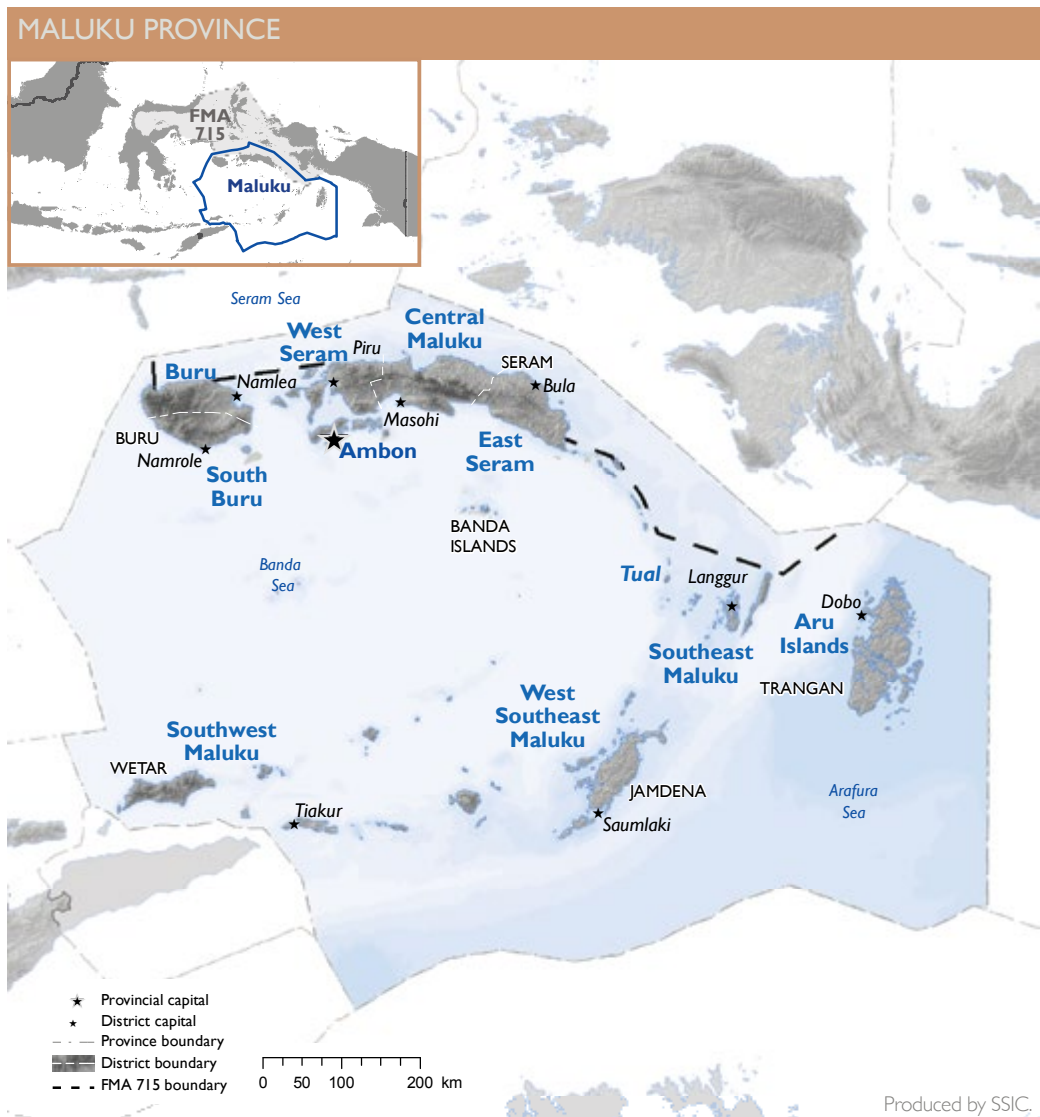
MALUKU

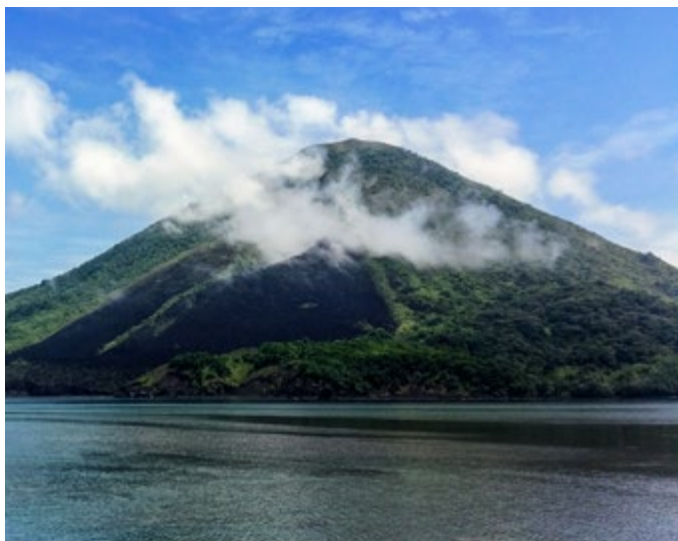




The depth of Maluku's seas combined with the isolation of the region has resulted in extraordinary levels of both marine and terrestrial biodiversity, including more than 600 species of reef-building corals.

The province of Maluku (Maluku provinsi) is situated to the southeast of FMA 715 and covers a total area of 581,376 km², more than 90 percent of which is marine waters (BPS Provinsi Maluku, 2017). The province is home to approximately 1,650,000 people, distributed across ten large islands, numerous smaller islands, and island clusters, with nearly 40 percent of the population living in coastal communities. The average population density for the province is 32 people/km² (BPS Provinsi Maluku, 2017).





K AZIS

Tectonically, this region is located in a highly active area known as the Molucca Sea Collision Zone. There have been over 70 serious volcanic eruptions in the province over the last 500 years, and earthquakes are common (Witton *et al.*, 2003). Many of the islands are geologically young (from one to fifteen million years old) and have formed independently from larger land masses. Due to its isolation and the depth of its seas – the deepest in the nation – the region has extraordinary levels of both marine and terrestrial biodiversity and a high number of endemic biota (Monk *et al.*, 1996). Approximately 100 endemic bird species can be found in the province as well as charismatic species such as the racquet-tailed kingfisher (*Tanysiptera galatea*) and red-crested Moluccan cockatoo (*Cacatua moluccensis*); land mammals include nocturnal marsupials and civets (Witton *et al.*, 2003).

Under water, the vibrant reefs teeming with life have made the province highly attractive to intrepid dive tourists. With an estimated 605 species of reef-building corals (including 15 endemic to the region) (Agustiadi and Luthfi, 2017), exploring the marine environment has been described as ‘descending through a blizzard of colors’ (Baron, 2013). From large schools of bumphead parrot fish to silvery shoals of fusiliers, darting Picasso triggerfish to cautious clownfish, the reefs of the region have been referred to as ‘underwater cities’ for marine life (Baron, 2013). The reefs are home to an estimated 434 reef-based fish species, of which 187 are caught as food fish (Limmon *et al.*, 2017; Sahetapy *et al.*, 2018), as well as 145 species of echinoderms and 913 species of marine mollusks (Hutomo and Moosa, 2005).

Further out to sea, the province is characterized by an extremely complex seafloor with exceptional depth gradients and diverse deep-sea yet near-shore habitats such as seamounts, canyons, sills, trenches, oceanic islands, upwelling zones, large-scale current systems, and numerous pinnales (Kahn *et al.*, 2017). These oceanic habitat types are increasingly recognized as important

MALUKU AT A GLANCE

TOTAL AREA

581,367 km²



MARINE AREA

527,191 km²

(91% of total)

POPULATION

~1,650,000



51%



49%

COASTAL

POPULATION

~40% *



KEY RELIGIONS

Islam 51%

Protestant 42%

Catholic 7%

Hindu <1%

KEY LANGUAGES

Indonesian, Ambonese

TIME ZONE

UTC+9

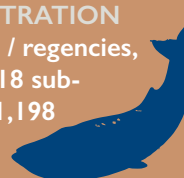
ADMINISTRATION

9 districts / regencies,

2 cities, 118 sub-

districts, 1,198

villages



Page 74: schooling blackfin barracuda in Sawai, Maluku

Previous page: typical fishing vessel for hand line fishers in Maluku

Above, left: many islands in Maluku are geologically young

A BRIEF HISTORY OF MALUKU

The name Maluku has been traced back to a 14th century Majapahit eulogy (*Nagarakretagama*) and is thought to have come from a local island term for the ‘head of a bull’ (Andaya, 1993); others suggest the name is derived from the term used by early Arab traders in the region – *Jazirat al-Moluk* – meaning ‘the island of the kings’ (Ricklefs, 1991).

Arab merchants began to arrive in the region in the 14th century, bartering for cloves and nutmeg (more valuable than gold at the time). Slightly later, the Italian merchant seafarer Niccolo de Conti provided key information on the islands to the cartographer Fra Mauro, who included it in his famous world map, thereby revealing the Spice Islands to European interests, opening the way for the race to the east (IATT, 2018). Over the next centuries, the region found itself in the midst of power struggles between Portuguese, Spanish, Dutch, and British colonial authorities, with bloody and brutal battles often resulting in the loss of entire island populations.

By the early 17th century, the region was alternately controlled by British and Dutch forces. One particular island – Rhun – was the scene of much dispute. It was held by the British for many years, but the Dutch fought hard for control of the island. At the time, the Dutch also held power over an area in the Americas that they called ‘New Amsterdam’. At the end of the second Dutch–Anglo war in 1667, an agreement was struck between the two nations (the Treaty of Breda) whereby the British would give control of Rhun Island to the Dutch in exchange for receiving control of New Amsterdam. Following the exchange, the British renamed their newly acquired lands ‘New York’ (now Manhattan Island), paving the way for British colonization of North America, and irrevocably changing the world’s geopolitical landscape (Brierley, 1994).

In more recent years since Indonesia’s independence, there have been periodic outbreaks of ethnic and nationalist violence in the region, notably in the 1950s, following the declaration of the Republic of Indonesia, and again in the late 1990s, when religious sectarian conflicts resulted in the displacement of approximately 500,000 people and the loss of thousands of lives (Head, 2000). Today, however, Maluku is a peaceful province, home to diverse ethnicities and keen to effectively utilize the beauty of the region’s natural and cultural heritage to promote sustainable tourism and development.

aggregators for pelagic species such as tunas, billfish, marine turtles, oceanic sunfish, and whale sharks (Kahn, 2008; Kahn, 2016; McGowan *et al.*, 2013; Worm *et al.*, 2003). Due to this diverse underwater topography, Maluku Province is also regarded as a hotspot for cetaceans, with recent studies supported by the USAID SEA Project finding at least 16 different cetacean species in these waters (Kahn *et al.*, 2017), including at least 6 different species of dolphins as well as great whale species such as the Bryde’s whale (*Balaenoptera brydei*), the beaked whale (*fam. Ziphiidae*), the sperm whale (*Physeter macrocephalus*), and the blue whale (*Balaenoptera musculus*). The Banda Sea in Maluku is considered to be a key migratory destination and turnaround point for the blue whale, with observations of this species suggesting behaviors of social interaction (possible courtship) in these waters (Kahn, 2014).

Administratively, the province is divided into nine regencies (Southwest Maluku Daya, Southeast Maluku, Central Maluku, Southeast Maluku, Buru, South Buru, West Seram, East Seram, and the Aru Islands) and two municipalities (Ambon and Tual), within which are 118 sub-districts and an estimated 1,198 villages (BPS Provinsi Maluku, 2017).

Ethnically, the province is highly diverse, with Melanesian and Austronesian ethnicities as well as people of Indian, Arabic, Chinese, Portuguese, and Dutch descent (Witton *et al.*, 2003). Over 130 languages were once spoken across the islands; however, many have now mixed to form local dialects, with Ambonese being the dominant lingua franca of the region (Witton *et al.*, 2003). The majority of the population is Protestant, Catholic, or Muslim, with some minority presence of Hindus and Buddhists (BPS Provinsi Maluku, 2017).

Almost two thirds of the population are of working age (15 years and over), with employment dominated by the agricultural sector (39 percent), including farming, forestry, and fishing. Key farmed products include coconuts, cloves, nutmeg, cocoa, cashew, and coffee as well as onions, cayenne peppers, cucumbers, and eggplants (BPS Provinsi Maluku, 2017).

Tourism to the area has increased in recent years, with a 22 percent increase in available accommodation between 2015 and 2017. Tourism is still dominated by the domestic market (96 percent), with a total of 95,783 tourists visiting the region in 2016. The vast majority of international visitors are European (BPS Provinsi Maluku, 2017).

The minimum wage in the province is officially 1,775,000 IDR/month (though informal sectors do not necessarily earn this amount). More than 19 percent of the population in the province are considered to be living at or below the national poverty standards (BPS Provinsi Maluku, 2017).

MARINE AND COASTAL MANAGEMENT IN MALUKU

In early 2017, the province of Maluku began the process of marine spatial planning (MSP) for the coastal waters under provincial jurisdiction (up to 12 nautical miles (nm) from the coast). This work is focusing on geographic clusters of islands (not defined by jurisdiction, but rather by ecological connectivity). Draft use zones for the plan (RZWP-3-K) are in development through inter-jurisdictional agreements between different districts and sub-districts; involving a wide range of stakeholders from a range of governmental and civil society organizations and institutions¹.









The process is also making efforts to incorporate the various traditional tenure arrangements existing across the region (under customary law) and formally recognize them in the spatial plans. This is challenging due to the lack of existing spatial documentation of customary tenure (*adat* areas), and the MSP process has galvanized a greater awareness in the province of the importance of documenting and recognizing these areas, with the expectation that many more will be incorporated into the spatial plan during its next review period in five years' time. Such recognition will allow community members with traditional tenure to access their own areas (up to 2 nm from shore) without any form of permit and will require any outsider fishers to gain express permission from the community before utilizing the area(s).

In addition to this, the plan will prioritize the general use of coastal waters up to 2 nm from shore for only small vessels, below 10 GT. With support from the USAID SEA Project, this spatial plan will improve the management of almost 2,000,000 ha of Maluku's provincial waters.

KEY INDICATORS FOR MALUKU PROVINCE	BASELINE	5 YR TARGET
Number of hectares of biological significance and/or natural resources under improved natural resource management as a result of USG assistance, applying MSP	0 ha	1,931,610 ha (in process)

These planning efforts have generated momentum for identifying areas appropriate for the establishment of new marine protected areas (MPAs) and re-galvanized commitments to effectively manage existing MPAs.

EXISTING MPAs IN MALUKU (2016)

DISTRICT / REGENCY	SHORT NAME	FULL NAME	SIZE (HA)
CENTRAL MALUKU	Ay-Rhun MPA	Kawasan Konservasi Perairan Pulau Ay - Pulau Rhun	114,312
	Current management effectiveness ranking: 0 [♦]		
			
	Lease MPA	Kawasan Konservasi Kepulauan Lease	81,573
	No management effectiveness ranking		
	Banda Sea Tourism Park	Taman Wisata Perairan Laut Banda	2,500
	Current management effectiveness ranking: 200 [♦]		
			
	Pombo Island Tourism Park	Taman Wisata Alan Laut Pulau Pombo	998
	MEF ranking: 52% [†]		
			
EAST SERAM	East Seram Regency MPA (Koon-Neiden)	Kawasan Konservasi Perairan Daerah Seram Bagian Timur	9,901
	Current management effectiveness ranking: 200 [♦]		
			
WEST SERAM	Kasa Island Tourism Park	Taman Wisata Alan Laut Pulau Kasa	1,100
	MEF ranking: 44%		
			
	Marsegu Island Tourism Park	Taman Wisata Alam Laut Pulau Marsegu	11,000
	MEF ranking: 46% [†]		
			
ARU ISLANDS*	Southeast Aru Marine Nature Reserve	Suaka Alam Perairan Kepulauan Aru Bagian Tenggara dan Laut Di Sekitarnya	2,500
	Current management effectiveness ranking: 200 [♦]		
			
SOUTHEAST MALUKU*	Southeast Maluku Regency Regional MPA	Kawasan Konservasi Perairan Daerah Kabupaten Maluku Tenggara	150,000
	Current management effectiveness ranking: 200 [♦]		
			
TUAL MUNICIPALITY*	Baeer Islands Tourism Park	Taman Wisata Pulau Baeer di Dusun Duroa, Kecamatan Pulau Dullah Utara	82
	No management effectiveness ranking		
WEST SOUTHEAST MALUKU*	Tanimbar Islands MPA	Kawasan Konservasi Perairan Daerah Kepulauan Tanimbar	783
	No management effectiveness ranking		

♦MMAF - E-KKP3K ranking

†MEF ranking is based on the management effectiveness tracking tool (METT) developed under the Ministry of Environment and Forestry (15/2015). Results < 33 percent suggest management is ineffective; 33 - 67 percent suggests management is present but not optimally effective; > 67 percent suggests area is sufficiently effective in terms of basic management.

* Located outside the boundaries of FMA 715



USAID SEA / I R TARMIDJ

Prior to the MSP process, the province had already established 11 MPAs covering a combined total area of 374,749 ha, with the aim to conserve marine biodiversity (providing refuges for ETP species) and to promote the re-stocking of neighboring fishery grounds by protecting fish-breeding areas, spawning aggregations, and promoting spillovers. Many of these MPAs are in the initial stages of establishment, but four of the sites (Banda Sea, Koon-Neiden, Aru, and Southeast Maluku MPAs) have progressed to level 2 ranking (conservation area established) and are in the process of advancing towards effective management.

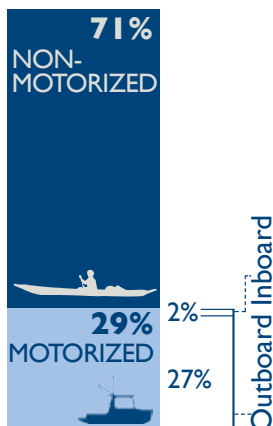
- Above: fishing vessel at harbor in Maluku
- Right: trevally hunting in a bait ball
- Over page: Maluku fisherman with line fishing gear

KEY INDICATORS FOR MALUKU PROVINCE

	Number of hectares of biological significance under improved natural resource management by applying MPA management as a result of USG assistance		Number of hectares of biological significance and/or natural resources showing improved biophysical conditions as a result of USG assistance		Percent change in biomass of reef fish in selected MPAs	
	BASELINE (ha)	5 YR TARGET (ha)	BASELINE (ha)	5 YR TARGET (ha)	BASELINE (kg/ha)	5 YR TARGET (kg/ha)
Ay-Rhun MPA	0	47,968	0	4,797	662	+66 (728)
Sawai MPA (new)	0	99,621	0	9,962	2,074	+ 207 (2,281)
Lease MPA	0	81,573	0	8,157	no data	no data
Koon-Neiden MPA	0	9,901	0	990	1,542	+ 154 (1,696)
Buano MPA (new)	0	38,662	0	3,866	2,866	+ 287 (3,153)
TOTAL TARGETS *	At least 229,390 ha		At least 250 ha		At least a 10% increase in fish biomass	

* Total targets are lower than the sum total of site targets. Figures reflect the minimum anticipated achievements for the province.

MALUKU FISHING FLEET

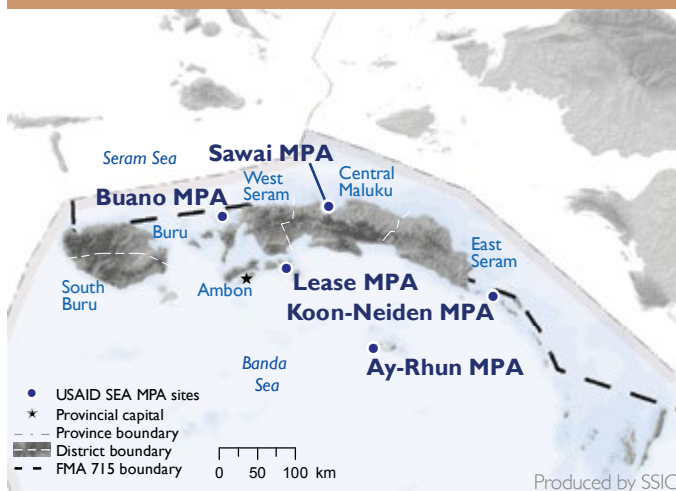


FURTHER INFORMATION

about MPAs: see volume one, chapter four (action framework: establishing marine protected areas)

about MPA effectiveness rankings and the steps required to establish and effectively manage MPAs: see volume two, chapter three

USAID SEA SUPPORTED MPAs: MALUKU



Y PANGASTUTI

Therefore in 2016, the USAID SEA Project initiated support for three of these existing MPAs: Ay-Rhun, Lease, and Koon-Neiden as well as for the establishment of new MPAs in Sawai and Buano.

By 2021, the initiative aims to have achieved improved natural resource management of at least 229,390 ha of biologically significant marine natural resources in Maluku, with at least 250 ha protected under no-take zone (NTZ) status and showing improved biophysical conditions. Additionally, the project aims to have increased fish biomass by up to 10 percent in each MPA.

The fishery resources of this province are estimated to provide livelihoods for more than 52,000 households (BPS Provinsi Maluku, 2017). In addition to this, marine products are essential for food security in the province, particularly for coastal communities, who are highly marine-resource dependent. Marine products are harvested for local subsistence, domestic markets, and international trade. There are also a number of aquaculture areas in the province, including shrimp farms and grow-out pens for the live reef fish trade.

In 2016, marine fishery production from the province was estimated to be more than 567,000 tons, with a value of 5.039 billion IDR (approximately 366,000 USD). Since this estimate was based on auction house transactions (which are a relatively small proportion of overall fishery harvests), this figure likely under-represents the true fishery productivity of this region (BPS Provinsi Maluku, 2017).

Key fishery products include pelagic species, such as skipjack tuna, anchovies and trevally, grouper and snapper species as well as non-fish species such as sea cucumbers and crabs. Fishing vessels in the province are mostly non-motorized, and fishing is undertaken using a range of different gear types.



WWF / K PRASYETO

USAID SEA SUPPORTED FISHERIES: MALUKU



Produced by SSIC.

Sustainable fishery management began to be supported in 2016 under the USAID SEA Project, through the implementation of EAFM, targeting five different fishery regions across the province.

The support provided by the USAID SEA Project aims to improve the natural resource management of at least 500,000 ha of biological significance for fisheries by 2021, with selected areas expected to see an increase of up to 10 percent in CPUE. In addition to this, at least 400 small-scale fisher vessels will have been registered through support from the project.

KEY INDICATORS FOR MALUKU PROVINCE

BASELINE 5 YR TARGET

Number of hectares of biological significance and/or natural resources under improved natural resource management by applying as a result of USG assistance, applying EAFM	0 ha	579,483 ha
Percent change in CPUE for selected gear and landing sites	Data currently being analyzed (kg / unit of effort)	10% improvement
Number of small vessels registered	0	400

Through the work being implemented in spatial planning, MPA development, and sustainable fisheries management, the USAID SEA Project will be trialing at least three innovations for marine and coastal management. To date, an innovative process for participatory mapping to support the development of the spatial plans has already been implemented, and a number of the sites are in the process of trialing I-Fish technology to support the collation and analysis of fishery data.

Overall, these support efforts aim to provide direct increased economic benefits to at least 150 people across the province and ensure a more secure tenure for local custodianship or managed access in coastal waters for more than 650 individuals.

KEY INDICATORS FOR MALUKU PROVINCE

BASELINE 5 YR TARGET

Number of innovations supported with USG assistance	0	3
Number of people with increased economic benefits derived from sustainable natural resource management and conservation as a result of USG assistance	0	150
Number of people with more secure tenure or managed access	0	666

The support efforts underway in the province also aim to develop, adapt and/or produce at least four individual legislative products (be they laws, policies, strategies, plans or regulations) to support biodiversity conservation. The first of these is already in development (the RZWP-3-K spatial plan). In addition to this, improved law enforcement practices will be supported at a range of levels, from community-based *pokmaswas* to agency surveillance support.

KEY INDICATORS FOR MALUKU PROVINCE	BASELINE	5 YR TARGET
Number of laws, policies, strategies, plans, or regulations addressing biodiversity conservation officially proposed or adopted as a result of USG assistance	0	3
Number of people who apply improved conservation law enforcement practices as a result of USG assistance	0	60

FURTHER INFORMATION

about EAFM: see volume one, chapter four (action framework: fisheries)

about I-Fish technology, managed access, vessel registration, CPUE and steps required to achieve EAFM: see volume two, chapter four

about participatory mapping: see volume two, chapter three

about local custodianship of marine and coastal environments: see volume one, chapter four (traditional governance)

about law enforcement: see volume one, chapter four (action framework: enforcing the law)

about existing attitudes and behaviors being targeted across the region: see volume two, chapter five

about stakeholder training and capacity needs being addressed: see volume two, chapter six

To put these efforts on a solid foundation, the USAID SEA Project will provide necessary training and capacity building to at least 500 key stakeholders in the province, including government officials, fishers, collectors, community representatives, industry representatives, and relevant fisher and community associations.

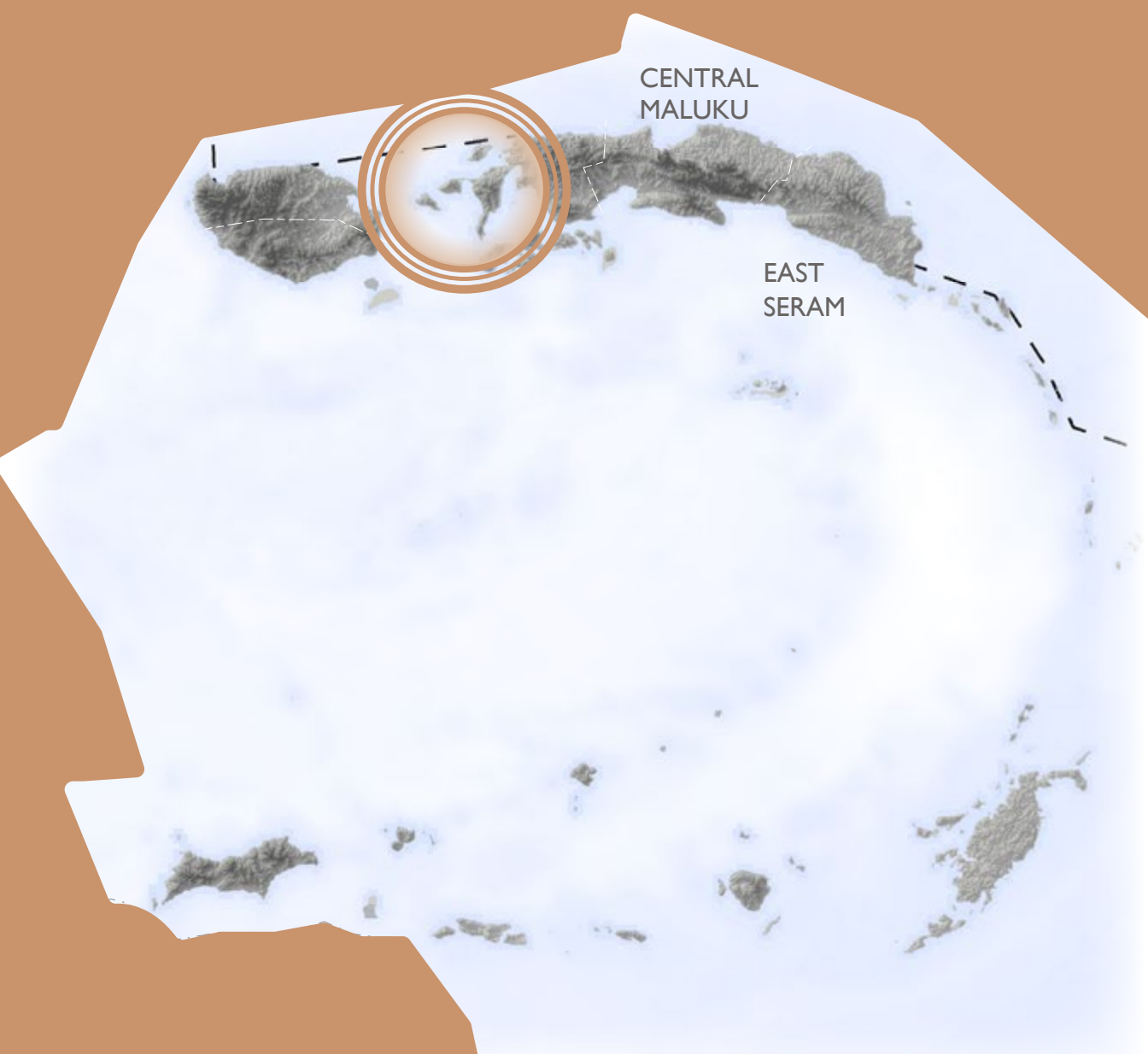
In addition to this, awareness and behavior-change campaigns will be implemented through select target MPAs and fishery sites in order to promote a greater understanding of the importance of sustainable management and the mechanisms to achieve it, as well as encourage the adoption of sustainable practices.

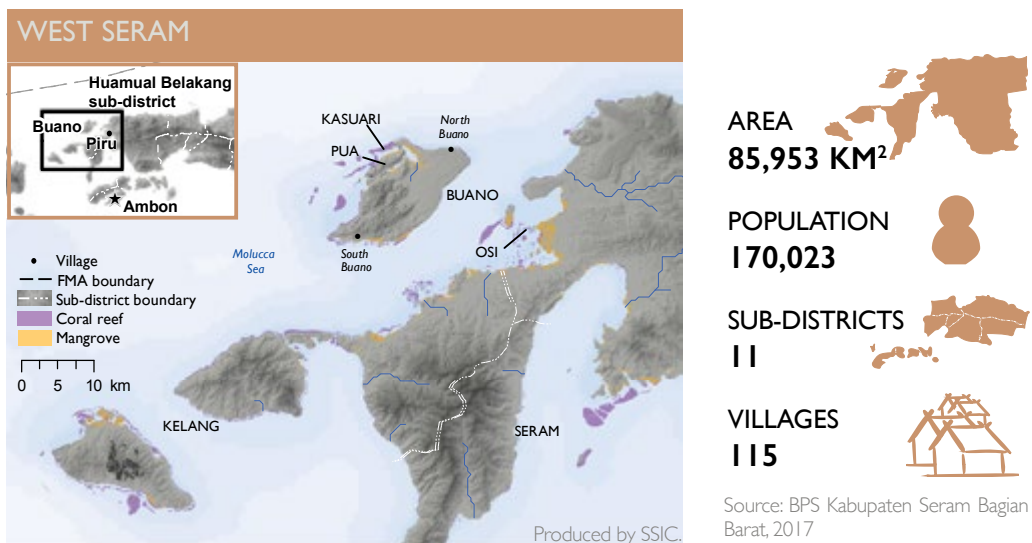
KEY INDICATORS FOR MALUKU PROVINCE	BASELINE	5 YR TARGET
Number of people trained in sustainable natural resources management and/or biodiversity conservation as a result of USG assistance	0	500
Number of people demonstrating behaviors that contribute to biodiversity conservation, as a result of USG assistance	0	400

The remainder of this chapter explores the key fishery and MPA sites of focus in Maluku province. Through these sections, we will learn what makes these areas so important to protect. We discover what has been learned so far about the places and the people, the marine environment and fishery resources, the fishers and other marine resource users of the areas, and we will see what steps are currently underway at each site to achieve sustainable management and to meet all of the above targets for the province.

¹ Under the Governor of Maluku, key entities involved in the marine spatial planning process are the provincial agencies for: Marine and Fisheries; Tourism; Forestry; Public Works; Transportation; Energy and Mineral Resources; and Environment. In addition to this, the planning is engaging representatives from the Regional Development Planning Agency, the One Stop Center for Capital Investment Integrated Service, the Regional Disaster Management Body, the Natural Resource Conservation Bureau, Forest Area Designation Bureau IX in Ambon, the Water Police and private sector representatives from P.T. Telekomunikasi and the State Electricity Company, supported by the Regional Spatial Planning Coordination Body and the Regional Secretariat.

WEST SERAM





Huamual Belakang is one of the eleven sub-districts of West Seram. Situated to the east of the large Seram Island, it covers an area of 409 km² and is ringed on its northwestern edge by a cluster of small islands, one of which is Buano Island (BPS Kabupaten Seram Bagian Barat, 2017).

Buano is rich in natural resources, with beautiful sandy beaches as well as rocky coastal clusters. To the northwest of the island, the Valentine Strait separates Buano from the neighboring Pua Island. At only 80 meters wide, this strait has become a key attraction for visitors to the region due to the dense mangrove vegetation and unique geophysical landscape of the area. Overall, the island is host to 18 species of mangrove covering a combined area of more than 40,000 ha¹, as well as seagrass beds² and fringing corals reefs (Welly et al., 2017c).

The waters around the island abound with life and are ecologically important for fishery spawning, providing a key source of fish larvae for neighboring islands. Recent studies identified 420 species of reef fish in the area (belonging to 143 genera and 42 families); *Pomacentridae* (damselfishes and clownfish) are the most commonly observed family, contributing 71 percent of all reef species. The region is also host to charismatic species, including a resident pod of dolphins, dugong, reef sharks, and manta ray. Green and hawksbill turtles can be found foraging the seagrass beds of the area and nesting on several of the beaches, and migrating whales have been observed off the coast (Welly et al., 2017c).

Two villages are situated on Buano Island (North Buano and South Buano), within which are several sub-villages (*petuanan*). Overall, the island has a population of approximately 7,000 people (2,300 households) (Tamanyira, 2016; Welly et al., 2017c).

These communities have a strong cultural heritage that guides many elements of daily life. The island has a king (Hon. King Kalam) who governs the island and is able to issue customary decrees and create local rules and enforcement mechanisms (Djunaidi, 2017; Yusuf et al., 2017). Across the island, the population is traditionally divided into 30 clans (family groups, *mata rumah*) belonging to five *nuru* (cultural groupings) (Welly et al., 2017c). These *nurus* promote familial bonds and influence ties and support networks throughout the communities.

THE FISHERIES OF BUANO

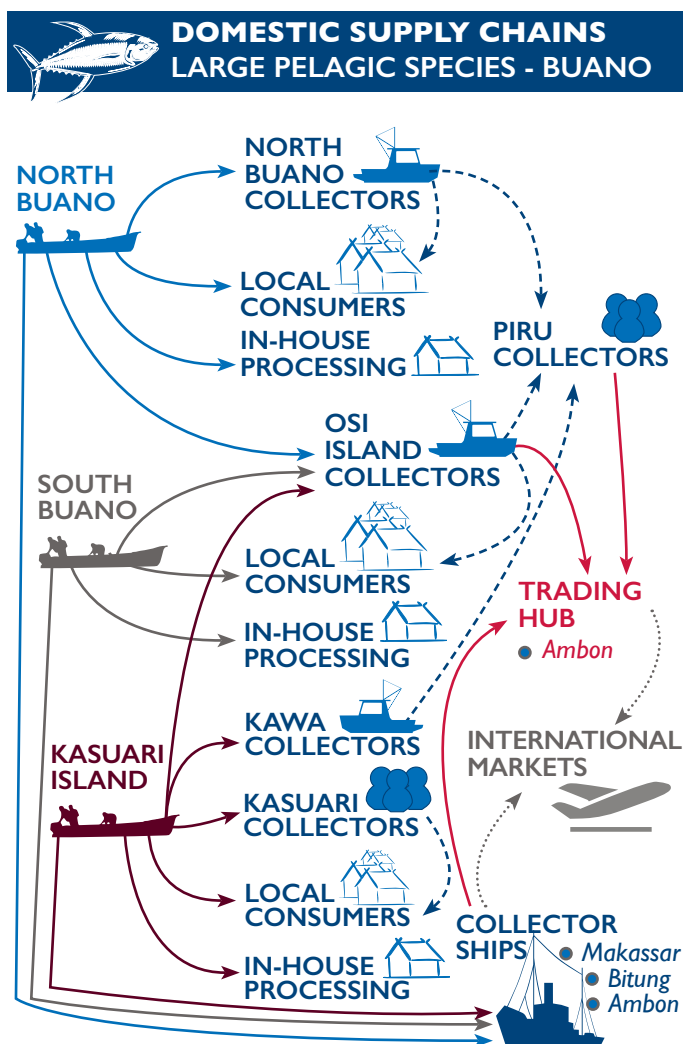
Fishing is a primary livelihood for an estimated 60 percent of the working age population on the island, with farming being a secondary livelihood (Tamanyira, 2016). In addition to this, many islanders distill and sell eucalyptus oil (*minyak kayu putih*), and the younger population often migrate for work to nearby islands, where they are generally employed in woodworking (Djunaidi, 2017).

In a survey conducted in 2017, it was found that the majority of fishers are aged 30 to 39 and have only elementary school education, with many dropping out of school to start fishing as young as 10 years old. Fishing is a hereditary livelihood, with most fishers coming from a fishing family dating back many generations.

The key fishery targets in this area include pelagic species such as tunas (*Thunnus albacores*, *Katsuwonus pelamis*, and *Euthynnus affinis*), trevally (*Carangoides orthogrammus*, *Caranx melampygus*, and *Caranx sexfasciatus*), and small pelagics such as mackerels and sardines (*Clupeidae spp.*). Key demersal target species include groupers³ (*Serranidae spp.*), snappers⁴ (*Lutjanidae spp.*), emperors (*Lethrinidae spp.*), and fusiliers (*Caesionidae spp.*) In addition to this, non-fish species are also harvested, including lobsters, sea cucumbers, and trochus sea snails (*Trochus niloticus*) (Sasi et al., 2017; Welly et al., 2017c).

The fishing grounds around Buano are not utilized only by the fishers from the island, but also by fishers from surrounding small islands and communities from Seram main island. The vast majority of fishers use hand lines, including kite lines and troll lines, with some few fishers using surrounding nets. In South Buano, some fishers also use spearguns, and in Kesuari Island compressor fishing to catch lobsters sometimes takes place (Sasi et al., 2017).

Fishing vessels from Buano are predominantly *kasko* longboats (made of fiber-reinforced plastic) or wooden boats with outboard engines (15 to 55 HP) (Tamanyira, 2016; Welly et al., 2017c). Handline fishers generally operate alone or in teams of two: a helmsman (*tanase*) and fisher (*pendega* or *masnait*), with teams usually coming from the same family.



Source: Sasi et al., 2017; Tamanyira, 2016; Welly et al., 2017c. Produced by SSIC.

Net fishers operate in larger crews and may be employees of the boat owners (Tamanyira, 2016; Welly *et al.*, 2017c).

Harvests tend to be optimal in October and November, and again in April and May, with yields generally reducing in June and July when strong weather and rough seas limit fishing activity (Welly *et al.*, 2017c).

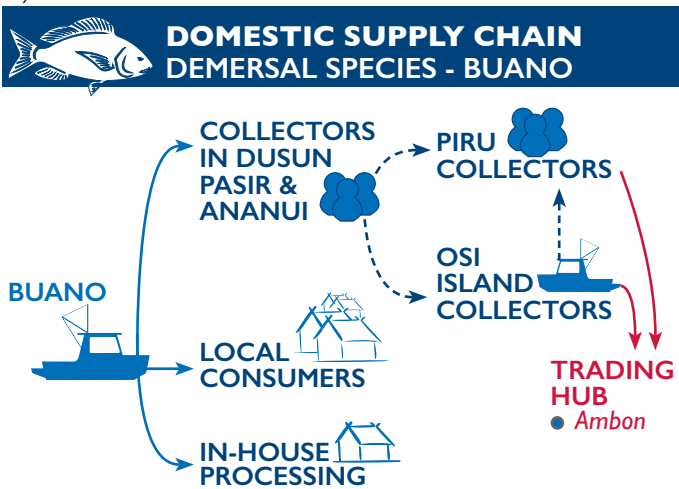
Many fishers use FADs (particularly in the popular fishing ground of Tanjung Pamali), with each FAD having a unique identifier code. However, overall fishery infrastructure is extremely limited on Buano, with no ice-making or storage facilities. This means that fishers need to make sales quickly to avoid wastage.

Sales are made through several mechanisms. On the island itself, fishers sell directly to consumers or to collectors (*jibu-jibu*), frequently women, who sell the fish locally to the villages on the island. At sea, collection vessels for valuable catch visit the area daily from Kasauri Island and further regions (predominantly Osi Island, Pelita Jaya, and Kawa) to purchase fish. These collectors generally trade the fish through Piru and onto Ambon. In addition to this, some larger collection vessels sometimes frequent the area from Ambon, Makassar, and Bitung (Sasi *et al.*, 2017; Tamanyira, 2016; Welly *et al.*, 2017c).

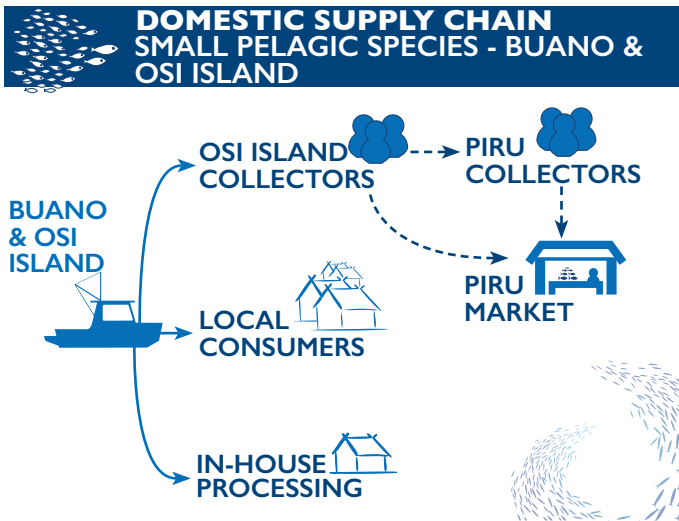
Apart from fresh sales, there are several home-based processing facilities on the island, producing smoked and salted fish.

The lack of fishery infrastructure is not the only challenge these fishers face. Many find it difficult to find the financial resources necessary to cover their operational costs and household expenses, particularly in monsoon season (when weather limits fishing activities), with incomes in this period often reducing to as little as 250,000 IDR/month (Welly *et al.*, 2017c).

In addition to this, the traditional vessels used by the fishers lack the advantages of modern technology, such as navigation systems and cold storage. Even where affordable, the lack of technical capacity is limiting adoption, and the lack of management skills is limiting options to streamline operations or explore value-add opportunities (Welly *et al.*, 2017c).



Source: Sasi *et al.*, 2017; Tamanyira, 2016; Welly *et al.*, 2017c. Produced by SSIC.



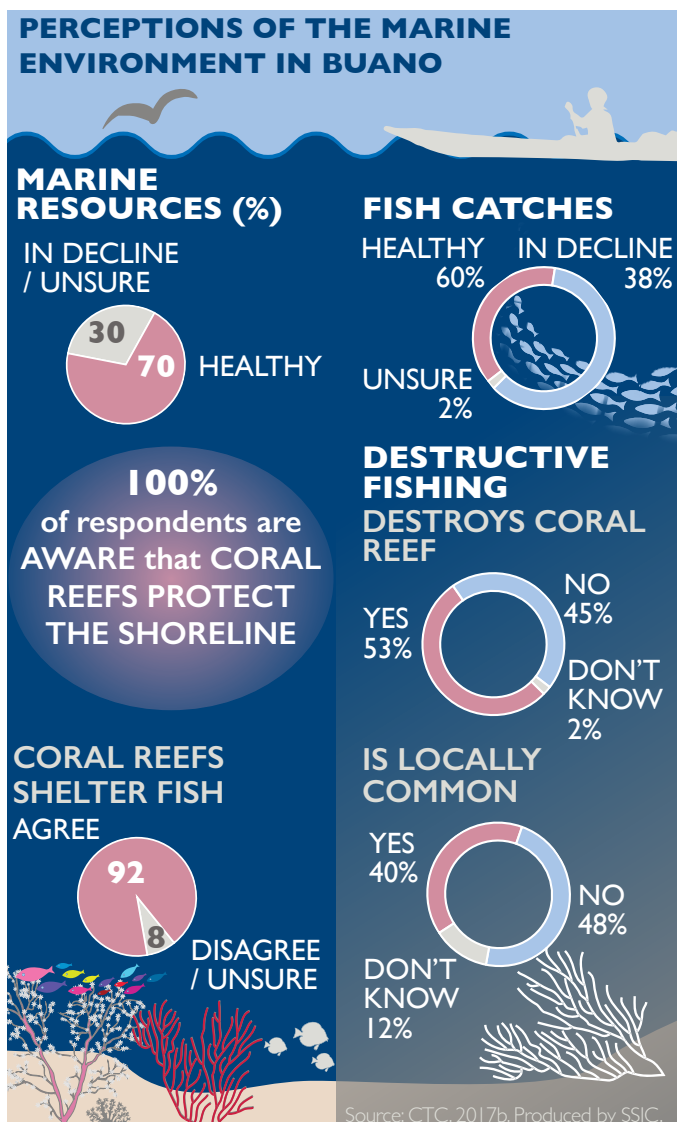
Source: Sasi *et al.*, 2017; Tamanyira, 2016; Welly *et al.*, 2017c. Produced by SSIC.

Finally, the waters of Buano are popular with fishers from other regions, creating scenarios of outsider fishers entering traditional fishing grounds. For example, in North Buano the key troll line fishing grounds of the region (Tanjung Pamali Sea, Naeselan, and Kasuari) are frequented by fishers from Ambon (particularly Yora fleet pole and line fishers), as well as Kawa and Labuan. In Osi and Pelita Jaya, the net fishers tend to operate in Kotania Bay, where they often encounter outsider fishers from Taman Jaya and Masika (Welly *et al.*, 2017c).

To date, conflicts have not arisen between the local and outsider groups, due in part to a sense of solidarity in the open waters of the area, where frequent rough conditions engender reliance on one another in case of difficulties. However, incidences of destructive fishing have damaged some of the habitat in the region, and where this leads to reduced productivity of the fishery pressures can increase, making it important to have clear management regimes in place to ensure the sustainability of these fishing grounds into the future (Welly *et al.*, 2017c).

The results of a perception survey conducted in 2017 reinforce this, with 40 percent of respondents⁵ feeling that destructive practices are still common in the area and 38 percent believing fishery resources were better in the past than today. Some respondents noted there were several

species no longer regularly seen in their waters⁶. While respondents generally felt their marine environment was still in a good condition, awareness about the impact of destructive fishing on coral reefs is limited (CTC, 2017b).



¹ Mangrove species of Buano island: *Acanthus ebracteatus*, *Acrostichum speciosum*, *Aegiceras corniculatum*, *Avicennia alba*, *Excoecaria agallocha*, *Buguiera gymnorhiza*, *Rhizophora stylosa*, *Rhizophora mucronate*, *Rhizophora apiculata*, *Ceriops tagal*, *Heritiera littoralis*, *Sonneratia alba*, *Pemphis acidula*, *Lumnitzera littorea*, *Lumnitzera racemosa*, *Xylocarpus granatum*, and *Xylocarpus moluccensis*.

² Seagrass species of Buano island: *Enhalus acoroides*, *Thalassia hemprichii*, *Halophila ovalis*, *Syringodium isoetifolium*, *Cymodocea rotundata*, *Halodule uninervis*, *Halodule pinifolia*, and *Halophila minor*.

³ Key grouper species include: red-mouth grouper (*Aethaloperca rogaa*), slender grouper (*Anypodon leucogrammicus*), bluespotted grouper (*Cephalopholis argus*), chocolate hind (*Cephalopholis boenak*), bluespotted hind (*Cephalopholis cyanostigma*), leopard grouper (*Cephalopholis leopardus*), coral hind (*Cephalopholis miniate*), six-blotch hind (*Cephalopholis sexmaculata*), strawberry hind (*Cephalopholis spiloparaea*), flagtail grouper (*Cephalopholis urodeta*), duskytail grouper (*Epinephelus bleekeri*), blacktip grouper (*Epinephelus fasciatus*), honeycomb grouper (*Epinephelus merra*), white-streaked grouper (*Epinephelus ongus*), longfin

SUSTAINABLY MANAGING BUANO AND ITS SURROUNDS

In order to promote the sustainable management of Buano Island and its surrounding waters, the USAID SEA Project is supporting both the establishment of a new MPA at the site and the implementation of EAFM for sustainable fisheries.

These efforts are kept within the cultural frameworks present in the region. The King of Buano is highly supportive of efforts to conserve and manage the marine and coastal environment effectively and has to date already implemented customary law to stop bomb fishing locally. This has resulted in the cessation of bomb fishing across the area, but more work is required to address other destructive practices, restore the marine habitat, and manage the coastal waters sustainably.

*“Because of the fish bombing, we lost hectares of coral reef.
People also cut down mangrove, which caused some fish species to disappear.”*

Hon. King Kalam, Buano

Marine resources in Buano are considered shared (unlike other areas in Maluku province, where there are community- or clan-based tenures over coastal areas). However, traditional *sasi* practices have been implemented in some areas. In Kawa, outsider fishers are required to stay more than 0.5 nm away from the shoreline (Sasi *et al.*, 2017). In several areas, *sasi* temporary closures (up to one year) are implemented to allow recovery and boosting of sea cucumber and trochus shell populations, which are then re-opened for communal harvest (Welly *et al.*, 2017c). In addition to this, when lobster fishers catch berried females (carrying eggs), they return them to the water (Sasi *et al.*, 2017).

There is also an existing MPA under formal governance (a marine nature tourism park, *Taman Wisata Alam Laut*), managed under the Ministry of Environment and Forestry (MEF). The MPA is located on Marsegu Island, in the strait between Buano and Seram main island. However, this does not extend to Buano's waters.

●
**read more about
customary sasi systems in
volume one, chapter four
(traditional governance).**

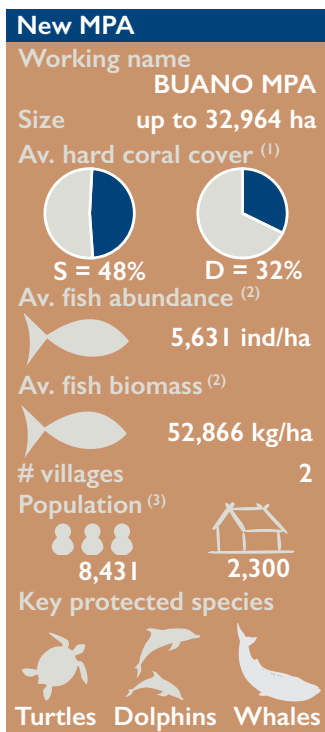
Therefore, in 2017, discussions commenced to explore the possibility of establishing an MPA around Buano's waters, with the potential to link up with the existing Marsegu MPA to protect this strait for both fisheries and as an important cetacean migratory path. At the time of writing, these discussions continue, and plans are underway to set aside up to 32,964 ha under the Maluku marine spatial plan (RZWP-3-K) for the establishment of a Buano MPA. Management of the MPA would be promoted collaboratively with the communities of Buano (under the leadership of the king). At the same time, fishery assessments are underway to support the implementation of management measures for sustainability.

grouper (*Epinephelus quoyanus*), four-saddle grouper (*Epinephelus spilotoceps*), spotted soapfish (*Pogonoperca punctate*), lunar-tailed grouper (*Variola albimarginata*), lyretail grouper (*Variola louti*), four-saddle grouper (*Epinephelus spilotoceps*), masked grouper (*Gracila albomarginata*).

⁴ Key snapper species include: two-spot banded snapper (*Lutjanus biguttatus*), two-spot red snapper (*Lutjanus bohar*), Spanish flag snapper (*Lutjanus carponotatus*), blackspot snapper (*Lutjanus fulviflamma*), blacktail snapper (*Lutjanus fulvus*), humpback red snapper (*Lutjanus gibbus*), Russell's snapper (*Lutjanus russelli*), black-banded snapper (*Lutjanus semicinctus*), midnight snapper (*Macolor macularis*), black and white snapper (*Macolor niger*), checkered snapper (*Lutjanus decussatus*).

⁵ Stakeholder respondents in perception monitoring: total = 40. Fisherman (n = 22), civil servant (n = 11), unemployed (n = 5), other (private sector, part time / contract workers, teachers, and seasonal fishers) (n = 2). 68 percent male, 32 percent female. Forty-three percent earn less than 1 million IDR, while a further 43 percent earn 1 to 5 million IDR. Note: the scale of the study only provides an insight into perceptions and does not represent the entire area in a statistically robust fashion.

⁶ Key species noted as absent or reduced in number in Buano waters in recent years: hairfin anchovy (*Thrissina baelama*), chocolate grouper (*Epinephelus pachycentrum*), tunas (*Thunnus*), emperors (*Lethrinus*), sharks (*Selachimorpha*), humphead wrasse (*Cheilinus undulatus*), Spanish mackerel (*Scomberomorini*), mackerels (*Rastrelliger*) and orange-lined triggerfish (*Balistapus undulatus*).



¹ Based on 50 m PIT x 3 replicates. S = shallow (< 4m), D = deep (10m). n = 10 (Welly *et al.*, 2017c).

² Based on UVC belt transects (50 x 5m), timed swims of 20 mins x 3 replications. The fish biomass ranging from lowest 443 kg/ha in Valentine–Sahana Ain Strait to highest 6,674 kg/ha in Tanjung Nasela. Fish abundance is counted per 11 families of commercial fish ranging from 787 ind/ha found in South Valentine–Sahana Ain Strait to highest 10,730 ind/ha in Tanjung Pamali (rounded data; Welly *et al.*, 2017c).

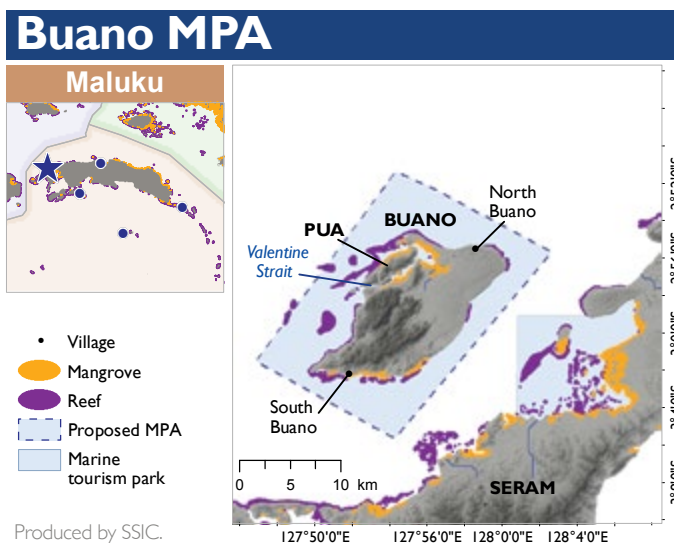
³ Welly *et al.*, 2017c, Tamanyira, 2016.



Above: karst limestone in the Valentine Strait in Buano

Right: coral reef in Buano

Far right: dolphin observed in Seram Sea



Current management effectiveness ranking: 0

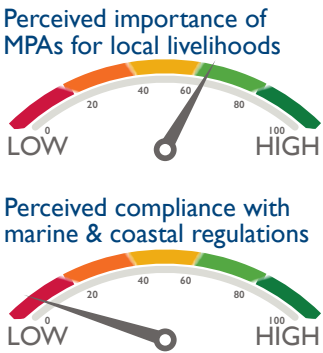


SUMMARY USAID SEA PROJECT SUPPORT

STEPS TO EFFECTIVE MPA MANAGEMENT SUPPORT (2016-2021)														
Level 1			Level 2				Level 3				Level 4			Level 5
MPA proposed	Inventory & area ID	Reservation of area	Management unit & personnel	Management & zoning plans	Facilities & infrastructure	Management funding	Plans approved	Management (SOPs)	Plans implementation	Designation (legal) of MPA	Boundary marking	Institutionalization	Resource management	Socioeconomics supported
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
														Independent MPA
														Optimally managed MPA
														Minimally managed MPA
														Established MPA
														Initialized MPA

● for a full description of the activities being implemented under each of these steps: see volume two, chapter three

While awareness of the importance of MPAs exists in the region, surveys undertaken in 2017 suggest greater awareness still needs to be promoted, as does greater compliance with government regulations.



B KHAN



PROMOTING EAFM

UNDERTAKING FISHERY ASSESSMENTS

Undertaking assessments for demersal and small pelagic fisheries in the target locations, particularly Buano Utara, Buano Selatan, Kasuari, and Kawa. Utilizing an I-Fish-compatible software to synchronize data management with the government fishery database.

STOCK
ASSESS

I-FISH

IMPLEMENTING FISHERY INTERVENTIONS

Utilizing the results of research to develop an EAFM action plan (based on the EAFM indicators provided by MMAF) and to reduce destructive fishing activities.

INPUT &
OUTPUT
CONTROL

MONITORING, EVALUATION & MANAGEMENT

Trialing small-scale fisher logbooks and promoting vessel registration (SIMKADA).

LOG
BOOKS

VESSEL
REG

for a full description of these activities: see volume two, chapter four

Based on the results of the 2017 surveys (CTC, 2017b), there is already a relatively good level of willingness to avoid destructive acts and report any environmentally destructive acts observed. However, commitment with regard to not consuming juvenile fish or ETP species was more wavering.

Commitment to report destructive practices



Commitment to avoid consuming juvenile fish



Commitment to avoid using destructive practices



Commitment to avoid consuming ETP species



Therefore, key behavior changes anticipated:

- Increased understanding of sustainable fishing practices and the importance of conserving ETP species
- Willingness to engage in MPA design, development, and collaborative management
- Willingness to comply with MPA zoning, including no-take zones
- Willingness to comply with MPA management regulations and management systems
- Adoption of sustainable fishing practices

Target audiences: Nuru leaders, fishers, collectors, jibu-jibu, community members, government

Key capacity-building support areas provided:

- Resource mapping and management planning
- Collaborative MPA management
- Logbook usage and SIMKADA
- Sustainable fisheries management (including post-harvest management)

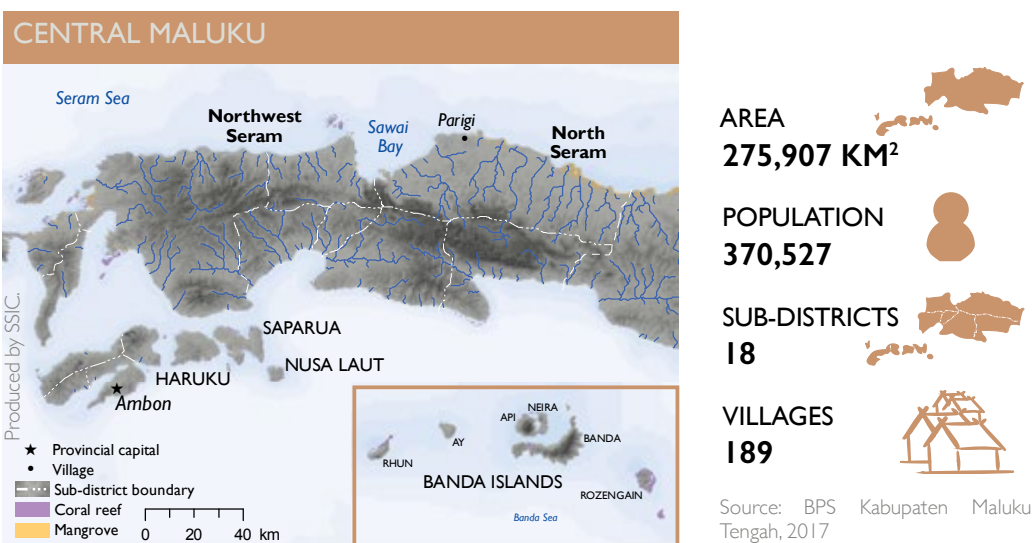
Target audiences: Nuru leaders, fishers, collectors, jibu-jibu, community members, government

Right: *andon* (outsider) lift net fishers often operate in the traditional waters of Buano



CENTRAL MALUKU





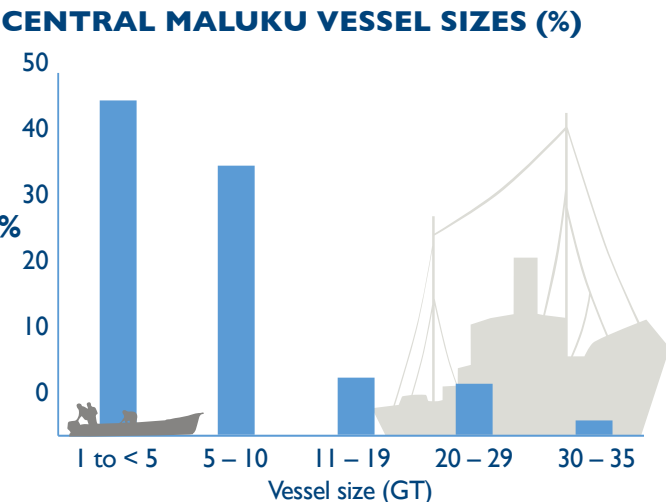
The Central Maluku district includes a total of 49 islands, 14 of which are inhabited. The region is sub-divided into 18 sub-districts, nearly all of which are coastal, with populations in the area having a strong dependency on the marine natural resources of the area (BPS Kabupaten Maluku Tengah, 2017).

Both fisheries and tourism are important livelihoods in this region. Nearly 30,000 fishers (supporting more than 15,000 households) are estimated to be active across the islands, with annual fishery production estimated to be more than 132,000 tons (BPS Kabupaten Maluku Tengah, 2017). Fisher groups (i.e. associations, cooperatives) are relatively common in the area, with nearly half of all fishers (13,000) having an active membership in one of the 3,204 fisher groups recognized in the district (BPS Kabupaten Maluku Tengah, 2017).

However, fisher incomes are low, with earnings estimated at an average monthly income of just 750,000 IDR (BPS Kabupaten Maluku Tengah, 2017). The vast majority of these fishers operate out of small vessels of less than 10 GT.

The region boasts 67 historical monuments and has designated 52 marine tourism destinations that are serving an increasing tourism market. To date, 108 hotels have been established across the district (mostly offering only basic accommodation), and at least 137 liveaboards visit the region regularly (BPS Kabupaten Maluku Tengah, 2017; Liveaboard.com, 2018).

Within Central Maluku, the USAID SEA Project is working at four priority sites to support sustainable fisheries management and biodiversity conservation: Lease Islands, Banda Islands, Sawai, and Parigi.



Source: BPS Kabupaten Maluku Tengah, 2017. Produced by SSIC.

FOR THE LIFE OF LEASE

The Lease Islands are located to the southwest of Seram Island, near Ambon. Covering a combined area of 176.5 km², they include Haruku Island, Saparua Island, and Nusa Laut Island as well as several small islets.

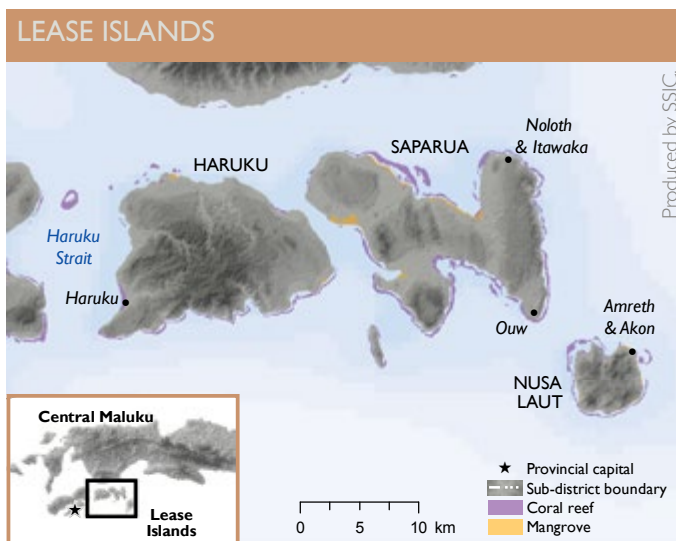
The islands are blessed by excellent coral reefs (in some areas reaching more than 70 percent coral cover), supporting at least 216 recorded species of reef fish (CTC, 2017f). Several small mangrove forests hug the coastline with 26 species¹ of mangrove found across the islands (CTC, 2017d). In addition to this, seagrass beds can be found at key locations, hosting up to eight seagrass species² (CTC, 2017e). Surveys conducted in 2017 also reveal the area is often frequented by cetaceans, including blue whales and dolphins (CTC, 2017f).

The islands are home to 63,517 people spread across 34 villages, one of the densest populations in Central Maluku (Ihsan et al., 2018). An estimated 4,048 households rely on fisheries for their livelihoods, targeting predominantly pelagic species, including skipjack tuna (*Katsuwonus pelamis*), mackerel tuna (*Euthynnus affinis*), sailfish (*Istiophoridae spp.*), mackerel scads (*Carangidae spp.*) and anchovies (*Engraulidae spp.*) (Ihsan et al., 2018; ITF, 2011). The majority of fishers use relatively traditional gears, including pole and line (*huhate*), trolling lines (*tonda*), and drifting gill nets (*jaring insang hanyut*). However, to the northeast of Saparua Island (Noloth and Itawaka villages), some fishers use purse seines and have FADs (stationed between 0.5 to 4 nm out to sea). The use of these FADs is controversial, and to date their use remains entirely unregulated, though studies suggest that overall catches from the region are still within (and under) the estimated potential of the area (Ihsan et al., 2018). This suggests there is still room to establish fisheries management systems that can both promote ecological sustainability and provide a sustainable revenue for fishers. With fishers earning an average of only 654,550 IDR/month, such optimization may be highly beneficial for livelihoods.

Tourism is also an important and growing livelihood in the region, with a range of homestays and guest houses located particularly on Saparua Island. Visitors find numerous attractions on these islands, including several 17th century forts from the time of spice trading (Fort Hoorn / Pelau and Fort Nieuw Zeelandia on Haruku Island, Fort Benteng Duurstede on Saparua Island, and Fort Beverwijk on Nusa Laut) as well as the oldest churches in Maluku. In addition to this, the islands are known for their handmade pottery production, particularly in the village of Ouw (BUD, 2018; ITF, 2011).

One of the biggest draws to Lease is undoubtedly the exquisite coastal environment, with excellent scuba diving locations. This includes the unique Haruku Strait dive site where hydrothermal vents release streams of hot water bubbles from the seafloor (divemasters are known to boil eggs in the vents) and the premier dive site of Ameth reef, which has been described as 'diving in a huge aquarium' (BUD, 2018). In Molana and Nusa Laut there are spectacular steep slopes with sea fans and enormous sponges. A total of 16 key dive sites are recognized across the islands, creating enormous potential for the development and advancement of sustainable marine tourism (BUD, 2018).

However, management of the marine and coastal environment is currently lacking, and this may undermine the potential for both livelihoods and biodiversity. Several reefs around Saparua Island have been historically damaged by blast fishing, and mangroves are being felled for use. Sand excavation is taking place at numerous locations around the islands, threatening coastal integrity and altering wave energy distribution; and like many areas where tourism starts to become a major economic force, the islands are suffering from increasing levels of pollution and waste entering the marine environment.



DEPOSITPHOTOS.COM

PROTECTING THE FUTURE OF LEASE

Above: schooling *Sardinella*

Like many areas in Maluku, the tradition of *sasi* has been implemented historically in Lease. Today however, only one village (*negeri*) continues this tradition in Lease, the village of Haruku. This community of less than 2,000 people have a *sasi* active for managing small pelagic *Sardinella* fish (*lompa* in the local language). The juveniles of this species enter the river estuary in this area between April and May each year, and *sasi* is enacted to ban fishing for them until seven months have elapsed, to protect the juveniles at this critical stage in their development (Ihsan *et al.*, 2018).

Other communities have expressed an interest to re-galvanize the tradition in their own coastal areas. This is encouraged and supported by the USAID SEA Project work underway at the site (USAID SEA, 2017). Communities in Ameth and Akon are already proactively working towards protecting their reefs from bomb and poison fishing and implementing trash clean-ups.

“I have learned many things about marine protection [through the project] and will share it with the community. I hope we will have a healthy ocean for our future generations.”

King Wempi Parinusa, Nusa Laut

More formally, in 2016, the government of Maluku established an MPA around the Lease Islands. Covering an area of more than 81,000 ha, the MPA surrounds the islands of Saparua and Nusa Laut as well as the eastern waters of Haruku Island. In 2017, the USAID SEA Project added Lease to their portfolio of support sites, due to its importance and proximity to Ambon, where it may be used as a learning and demonstration site for other MPAs in the region.

¹ Mangrove species in Lease are: *Acanthus ilicifolius*, *Acanthus ebracteatus*, *Acrostichum speciosum*, *Aegiceras corniculatum*, *Avicennia alba*, *Bruguiera cylindrica*, *Bruguiera gymnorrhiza*, *Bruguiera parviflora*, *Rhizophora apiculata*, *Rhizophora stylosa*, *Rhizophora mucronate*, *Heritiera littoralis*, *Nypa fruticans*, *Sonneratia alba*, *Sonneratia caseolaris*, *Scyphiphora hydrophyllacea*, *Campostemon shultzii*, *Excoecaria agallocha*, *Aegiceras floridum*, *Ceriops tagal*, *Avicennia marina*, *Dolicandrone spathacea*, *Xylocarpus mulucensis*, *Osbornia octodonta*, *Xylocarpus moluccensis* and *Lumnitzera littorea*.

² Seagrass species in Lease are: *Halodule pinifolia*, *Halophila ovalis*, *Enhalus acoroides*, *Thalassia hemprichii*, *Cymodocea serrulata*, *Syringodium isoetifolium*, *Halodule uninervis* and *Cymodocea rotundata*.

Legal name
Kawasan Konservasi
Pesisir dan Pulau-Pulau
Kecil Kepulauan Lease

Year est.
2016


Decree and status
Maluku Governor's
Decree No. 387 year 2016

Management plan? ✖


Zoning plan? ✖

Size
81,573 ha

Av. hard coral cover ⁽¹⁾



S = 44%




D = 42%

Av. fish abundance ⁽²⁾
5,227 ind/ha


Av. fish biomass ⁽²⁾
1,139 kg/ha

villages in MPA
27

Population ⁽³⁾




49,704




12,700


Key protected species




Turtles



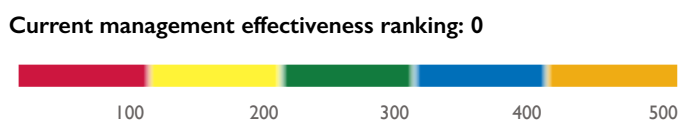
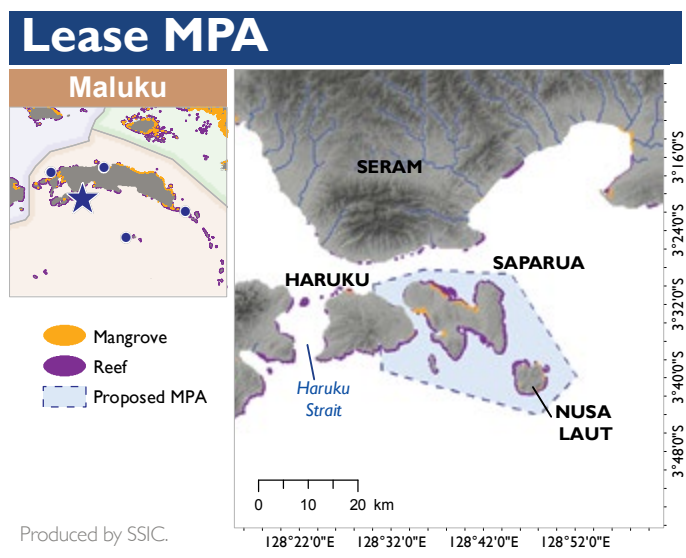
Seahorses



Dolphins



Dugongs



Support to the Lease Islands MPA will be focused towards advancing the effective management of the site to become a best practice learning platform for wider marine practitioners. Efforts will be particularly focused on galvanizing traditional stewardship systems in line with MPA planning and development for collaborative management. In addition to this, sustainable marine tourism is being promoted in the region, and a financing strategy and business plan for the MPA is being developed through the use of the Economic Rate of Return (ERR) model trialed under the USAID SEA Project.

Efforts will also promote collaborative management with the communities, many of whom are already expressing desires to manage the resources more sustainably.



¹ Based on 50m PIT x 3 replicates.
S = shallow (< 4m),
D = deep (10m). n = 14 sites. Sub-
strates = 7 categories (CTC, 2017f).
² Based on UVC belt transects (50 x
5m), timed swims of 60 mins x 3
replications. Fish abundance ranged
from 427 ind/ha to 17,187 ind/ha
(CTC, 2017f).
³ BPS, 2011.

 Right: diver on a vibrant coral
reef in Maluku
Far right: fisher in Maluku

SUMMARY USAID SEA PROJECT SUPPORT

[illegible]

for a full description of the activities being implemented under each of these steps: see volume two, chapter three

ECONOMIC RATE OF RETURN MODEL TRIALED AT THIS SITE

ERR

Key behavior changes anticipated:

- Willingness to engage in MPA zoning design, development, and collaborative management
- Willingness to comply with MPA zoning, including no-take zones
- Willingness to comply with MPA management regulations including limitations on sand excavations and mangrove harvesting
- Adoption of sustainable marine tourism practices

Target audiences: Community members, tourism industry, fishers, government

Key capacity-building support areas provided:

- Resource mapping and management planning
- Collaborative MPA management
- Sustainable marine tourism
- Sustainable MPA financing

Target audiences: Community members, tourism industry, fishers, government





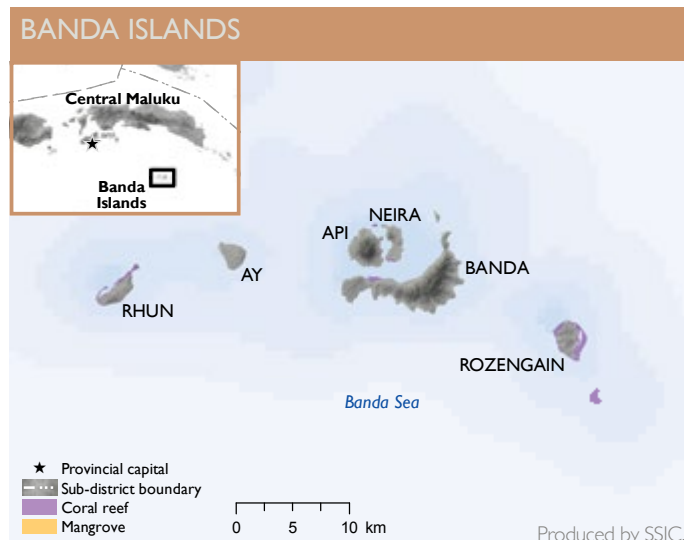
DEPOSITPHOTOS.COM

THE BOUNTY OF BANDA

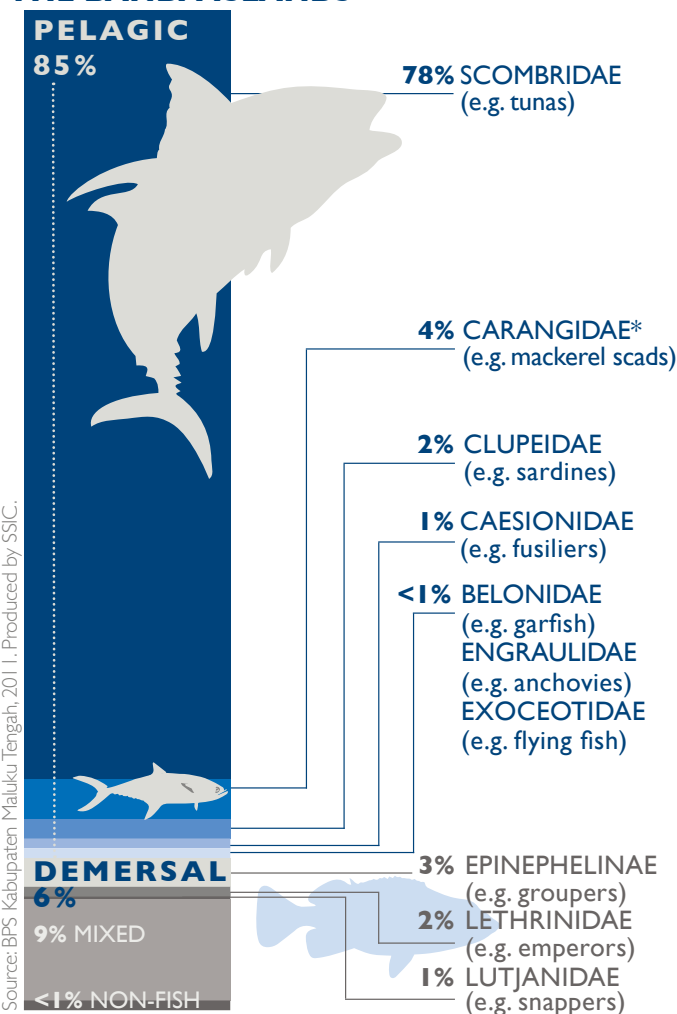
In the center of Maluku province, just south of the FMA 715 border, is a remote archipelago of islands of outstanding natural beauty. The Banda archipelago is comprised of 11 small islands and one atoll (Welly *et al.*, 2012). These islands are arguably at the heart of the spice trading history of the region and are the location of the notorious exchange of lands between the colonial Dutch and the British powers in the 1600s (where Rhun Island was traded for New York), an event that altered the course of world history.

The region is blessed with picture-perfect beaches surrounded by stunning coral reefs, and this, combined with the fascinating history of these remote lands, is making the region increasingly appealing to intrepid travelers (Kasoar Travel, 2017; Lonely Planet, 2018).

The islands have a combined population of approximately 20,000 people, with key livelihoods being fishing (predominantly for subsistence and local sale), spice farming and, in more recent years, tourism. In addition to this, the region is engaged in trading, and some commercial fisheries exist, for yellowfin tuna in particular (Welly *et al.*, 2012).



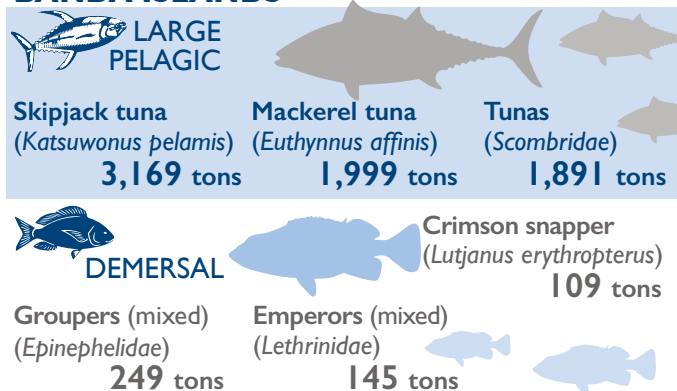
CATCH COMPOSITION IN THE BANDA ISLANDS



Source: BPS Kabupaten Maluku Tengah, 2011. Produced by SSIC.

* This family can include both pelagic and demersal species; however, catch of *Carangidae* at the Banda Islands is dominated by pelagic variants of this family.

CATCH VOLUME (TONS) PER YEAR: BANDA ISLANDS



*Total production recorded for commercially important fish in the Banda Islands in 2011.

Source: BPS Kabupaten Maluku Tengah, 2011. Produced by SSIC.

Fish catches from the region are dominated by pelagic species (*Scombridae*) such as skipjack tuna (*Katsuwonus pelamis*) and mackerel tuna (*Euthynnus affinis*)³, with demersal species including groupers (*Epinephelidae*)⁴, emperors (*Lethrinidae*), and snappers (*Lutjanidae*)⁵, including the crimson snapper (*Lutjanus erythropterus*) (BPS Kabupaten Maluku Tengah, 2011; Welly et al., 2012).

Catches are generally for subsistence and sale within the communities, but yields of more commercially-valuable species (tuna and quality snappers and groupers) are often sold to collector vessels that visit the area, predominantly from Ambon.



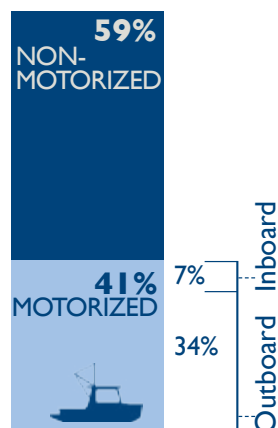
Above, left: fresh catch of skipjack tuna in the Banda Islands

Above: bundle of tuna for sale at local market



WWF / F FIRMANSYAH

BANDA ISLANDS FISHING FLEET



The most common gear types used across the islands are trolling lines, kite lines, hand lines, and drift gillnets (which combined make 89 percent of all gears used) (BPS Kabupaten Maluku Tengah, 2011). Fishers generally operate out of small vessels and long boats, working individually or in crews of up to four people (Welly et al., 2012). Fifty-nine percent of the Banda fleet is non-motorized (BPS Kabupaten Maluku Tengah, 2011).

However, during focus group discussions with Banda islanders held in 2012, fishers noted that catches had been declining in recent years, with fish caught generally of smaller size than previously, suggesting overfishing is occurring. Tuna fishers noted an increase in tuna longliners operating in Banda waters from outside the region, creating competition over resources. Demersal fishers cited the increased use of beach seines and local nets known as *pukat tarik*, with mesh sizes often less than 1 cm, as causing indiscriminate catches and leading to decreased overall productivity (Welly et al., 2012).

Amongst the tuna fishers it was also noted that acquiring bait fish was becoming more difficult due to increased numbers of purse seines (*jaring bobo*) operating in the area, with mesh sizes similarly often less than 1 cm. This loss of bait fish is in turn leading to reduced tuna harvests, and where local fishers would previously only target large tuna (> 20 kg), they now find themselves often limited to catching juvenile tuna in order to maintain their livelihoods and meet the demands of the buyers (Welly et al., 2012).

Fishers are also facing challenges due to the remoteness of the islands. With very limited fishery infrastructure in place (including lack of cold storage and limited ice-making facilities), fishers often find themselves having to compromise on price with the collectors. In addition to this, where collectors choose not to purchase, it can lead to high levels of waste.

Therefore, it has become imperative to promote the sustainable management of the Banda Islands in the immediate term if the natural resources are to be secured for both local livelihoods and national heritage.

³ Other pelagic catches in Banda include members of the *Carangidae* family, such as bluefin trevally (*Caranx melampygus*) and mackerel scads (*Decapterus macarellus*), as well as small pelagics such as goldstripe sardinella (*Sardinella gibbosa*), Indian mackerel (*Rastrelliger kanagurta*), redbelly yellowtail fusilier (*Caesio cuning*), rainbow jack (*Elagatis bipinnulata*), anchovies (*Engraulidae* spp.), flying fish (*Exocoetidae* spp.) and garfish (*Belonidae* spp.)

⁴ Key grouper species include: bluespotted grouper (*Cephalopholis argus*), flagtail grouper (*Cephalopholis urodetata*), honeycomb grouper (*Epinephelus merra*), masked grouper (*Gracila albomarginata*), and lyretail grouper (*Variola louti*).

⁵ Other key snapper species include: two-spot red snapper (*Lutjanus bohar*), midnight snapper (*Macolor macularis*) and black and white snapper (*Macolor niger*).



DEPOSITPHOTOS.COM

SAFEGUARDING THE BANDA ISLANDS

As far back as 1977, the importance of the marine and coastal environment of the Banda Islands was recognized, and a marine protected area was established by the Ministry of Agriculture (at the time) around the main island of Pulau Banda (CTC, 2017g). In 2009, this MPA was transferred to be managed under the MMAF and became a marine tourism park (*Taman Wisata Perairan – TWP*). However, since the MPA covered only 2,500 ha, it was soon agreed amongst government and community stakeholders that more conservation areas would be required for the archipelago to be managed sustainably. By 2014, the TWP management plan recognized the importance of wider areas beyond its existing boundaries, and the Banda Island MPA network was initiated.

Within this network, two islands – Ay and Rhun – to the east of the archipelago have received particular attention, as they connect Sulawesi, West Papua, and the Savu Sea, harbor important cetacean migration routes in the area, have high levels of biodiversity and fisheries productivity as well as great potential for marine sustainable tourism. In 2016, these islands became the location for the second formal MPA in the archipelago, the Ay–Rhun MPA (*Kawasan Konservasi Perairan Pulau Ay – Pulau Rhun*).

In the same year, the USAID SEA Project began to provide support to this site, with the aim of advancing the effective management of the MPA and promoting sustainable marine tourism. At the time of writing, collaborative management systems are in the process of being developed, engaging community leaders and fishers in the zoning and management design of the area. MPA regulations are expected to be supported through traditional *adat* customary laws, with community surveillance groups (*pokmaswas*) supporting implementation.

An entrance fee system is also anticipated to be developed as a form of payment for ecosystems services of visitors to the area, and a range of capacity support is envisaged to help local community members capitalize on the emerging opportunities of tourism to the region.



Above, left: purse seines are blamed for a decrease in bait fish

Above: the Banda Islands, Maluku

Legal name
Kawasan Konservasi
Perairan Pulau Ay -
Pulau Rhun

Year est.
2016


Decree and status
Decree of Governor of
Maluku no. 388 year 2016

Management plan? ✗


Zoning plan? ✗

Size
47,969 ha

Av. hard coral cover ⁽¹⁾



S = 68%




D = 53%

Av. fish abundance ⁽²⁾
1,254 ind/ha


Av. fish biomass ⁽²⁾
895 kg/ha

villages in MPA
2

Population ⁽³⁾




3,383




857

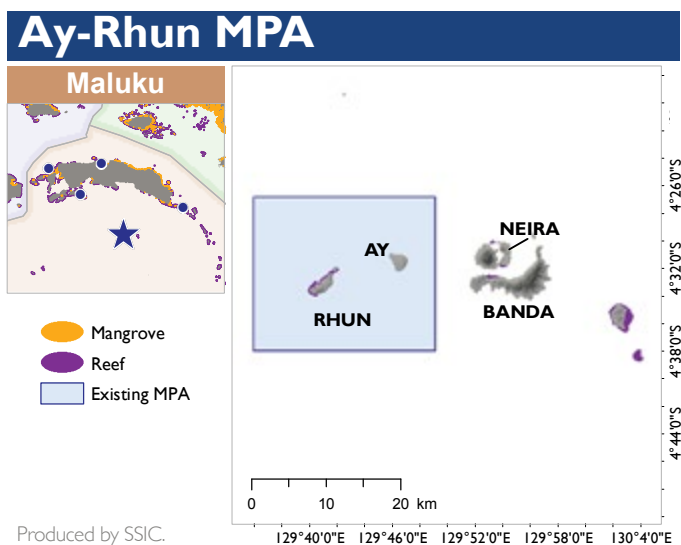
Key protected species



Napoleon wrasse



Dolphins



Current management effectiveness ranking: 0



Ay Island covers an area of just 353 ha and has a population of 1,369 people (377 households) (BPS, 2011). The island still has active nutmeg plantations and the remains of Fort Revenge (circa 1616) along with old colonial plantation mansions. Its marine environment is characterized by spectacular coral-clad drop-offs that plunge hundreds of meters with exceptional visibility, making the area a popular diving destination (Banda Neira, 2017a).

Key fisheries on this island are demersal species, particularly snappers (*Lutjanidae*), groupers (*Serranidae*) and emperors (*Lethrinidae*). However, pressures on the resources have led to reduced numbers of sweetlips (*Haemulidae*), wrasses

¹ Based on 50 m PIT x 3 replicates. S = shallow (3m), D = deep (10m). n = 4 stations. (Welly et al., 2012a).

² Based on UVC belt transects (50 x 5m), timed swims 20 mins x 3 replications. Fish abundance at the four sites was: Ay West: 1,882 ind/ha; Ay North: 934 ind/ha; Rhun: 754 ind/ha; and Nailaka: 1,446 ind/ha. Fish biomass was: Ay West: 525 kg/ha; Ay North: 515 kg/ha; Rhun: 620 kg/ha; Nailaka: 1,921 kg/ha (Welly et al., 2012a).

³ BPS, 2011.



Right: Napoleon wrasse




(*Labridae*), and rabbitfish (*Siganidae*) and to the absence of tunas (*Scombridae*) and barracudas (*Sphyrnidae*) (Welly et al., 2012). With improved management it is hoped that these commercially important species may return. The western region of Ay Island has been identified as most suitable to protect in order to enhance stock levels, while the northern region is appropriate for sustainable utilization.

Rhun Island covers an area of just 398 ha and has a population of 2,015 people (480 households) (BPS, 2011). The site of the notorious exchange between the Dutch and the British, this island and its neighboring small island of Nailaka, still have historical monuments, including forts (Fort Swan, dating back to 1636, and Fort Defense from 1640) and colonial architecture. Historical houses have been adapted by the communities who are today fishers and traders, and the island is host to a small harbor for predominantly traditional sailing cargo ships (Banda Neira, 2017b).

Key fisheries on this island are also demersal, with healthy stocks of wrasses (*Labridae*) and other commercial fishes, like emperors (*Lethrinidae*), snappers (*Lutjanidae*), and groupers (*Serranidae*). This is also where some of the archipelago’s finest wild pearls (highly valued by collectors the world over) are found by local divers still using traditional methods (Banda Neira, 2017a). However, on Rhun, like on Ay Island, marine species such as tunas (*Scombridae*) and barracudas (*Sphyrnidae*) are lacking, and sustainable management will be important to promote these pelagic fishery stocks and sustain the biodiversity of the area (Welly et al., 2012).

SUMMARY USAID SEA PROJECT SUPPORT

STEPS TO EFFECTIVE MPA MANAGEMENT SUPPORT (2016-2021)													
Level 1			Level 2			Level 3			Level 4			Level 5	
MPA proposed	Inventory & area ID	Reservation of area	Management unit & personnel	Management & zoning plans	Facilities & infrastructure	Management funding	Plans approved	Management (SOPs)	Plans implementation	Designation (legal) of MPA	Boundary marking	Institutionalization	Resource management
													Socioeconomics supported
													Community welfare improved
													Sustainable funding
Achieved pre-USAID SEA Project support			✓	✓	✓	✓	✓	✓	✓				
													Independent MPA
													Optimally managed MPA
													Minimally managed MPA
													Established MPA
													Initialized MPA


 for a full description of the activities being implemented under each of these steps: see volume two, chapter three

Key behavior changes anticipated:

- Willingness to engage in MPA design, development, and collaborative management
- Willingness to comply with MPA zoning, including no-take zones
- Willingness to comply with MPA management regulations and management systems
- Increased understanding and adoption of sustainable fishing practices

Target audiences: *fishers, community members, local government*

Key capacity-building support areas provided:

- Resource mapping and management planning
- Pokmaswas community surveillance development
- Fee management (payments for ecosystem services)
- Sustainable marine tourism development and implementation

Target audiences: *fishers, community members, local government*

THE SEAS OF SAWAI

Sawai Bay is located on the northern coast of Seram Island, situated between two sub-districts (North and South Seram). It is the largest bay area in Maluku province, covering an area of 1,100 km², and is rich in natural resources (Mustofa *et al.*, 2017; Yusuf *et al.*, 2017). With shorelines dominated by mangroves⁶, extensive seagrass⁷ beds providing feeding grounds for dugong, and beaches where turtle nesting occurs annually, this bay is a hotspot for biodiversity. Resident dolphins can be found in the bay, and whale sharks are thought to frequent the waters around August every year (Sasi, 2017b; Yusuf *et al.*, 2017).

There are 13 communities of mixed ethnicity in and around the bay; and migrants from Java, Sumatra, Sulawesi, Flores, and Tonghloa, many of whom have been present for two or more generations, live amongst the indigenous Sawai population (Wisese *et al.*, 2016b). Education levels across the communities are relatively low. Most adults have completed elementary school; however, children's school attendance is highly variable between communities, from only 13 percent of school-age children attending school in Labuan village to 45 percent in Sawai village, suggesting there may be some degree of disparity in economic means between communities (Sasi, 2017a; Wisese *et al.*, 2016b). Key livelihoods in the bay area are farming, tourism, and small-scale fisheries.

Approximately 80 percent of the population engage in some level of farming as either a primary or secondary income. Farmed products are dominated by coconuts, copra, cloves, cocoa, and cassava. In addition to this, communities harvest forest products (particularly sago) and raise livestock (predominantly goats and chickens) (Sasi, 2017a; Yusuf *et al.*, 2017).

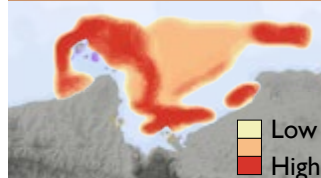
Tourism development in Sawai began in the 1990s and has rapidly expanded. The key areas of tourism activity are Saleman (Ora beach) and Sawai villages. In these two communities, between 30 and 50 percent of the population are involved in tourism, from running accommodation establishments (homestays) to offering transportation or guiding services or running small food stalls catering to visitors (Wisese *et al.*, 2016b).

Surrounding communities are also engaged in tourism livelihoods, predominantly in the form of providing rental boats, selling agricultural and fish products, and offering cultural activities (such as a chance to see traditional sago processing). More recently, speedboat services have also been introduced to the area, and more homestays have been developing in Pasanea area (Wisese *et al.*, 2016b).

Key tourism attractions in the region include the highly popular beaches (particularly Ora beach), stunning underwater

DISTRIBUTION OF MEGAFaUNA IN SAWAI BAY

DOLPHINS



WHALES



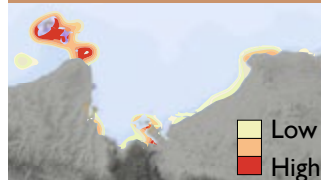
DUGONG



SHARKS



TURTLES



Source: Wisese *et al.*, 2016.
Reproduced by SSLC.



Right: sago processing

SAWAI BAY



environments, caves, waterfalls, diverse fauna and flora, and beautiful landscapes (Lelloltery, 2008). Advances in marketing through social media and increased connections to tour operators in Ambon and Jakarta, combined with Sawai being featured in magazines and television, have led to an estimated average of 1,500 visitors to the bay annually. The majority of visitors are domestic tourists (from Java, Ambon, Sumatra, and South Sulawesi), with international visitors coming predominantly from Europe (Wisesa et al., 2016b).

Approximately 30 percent of the population in Sawai bay undertake fishing as either a primary or secondary livelihood. Target catch are demersal species (85 percent) such as emperors (*Lethrinidae spp.*)⁸, snappers (*Lutjanidae spp.*)⁹, and groupers (*Serranidae spp.*)¹⁰, with the remainder being pelagic species and non-fish species, including sea cucumbers, trochus, and clams (Wisesa et al., 2016b).

The vast majority of fishers (more than 90 percent) use hand lines as their preferred fishing gear, with only a small proportion of fishers using troll lines, gillnets, and bottom long lines. Nearly half of all fishers operate out of non-motorized vessels, with the majority of motorized vessels being local *ketinting* boats with engines up to 15 HP (Mustofa et al., 2017).



As there are no landing facilities or ports in Sawai bay, 90 percent of fish are landed at beaches near the fisher homes. From here, the majority of catch (on average up to 90 percent) is utilized for subsistence and local consumption. During low yield fishing seasons, 100 percent of catch is utilized for local consumption. Sometimes, this is insufficient and does not meet local needs, meaning that communities have to purchase marine products from other regions

(particularly Amahai, on the southern side of Seram Island).

When surplus is available for sale, it is sold to local collectors (*jibu-jibu*). With demersal fish, these local collectors sell directly to consumers across the villages as well as to larger collectors and aggregators in Masohi (which is on the south coast of Seram Island) and Ambon. From here, sales are made locally (to markets and restaurants) as well as further afield, to distributors in Makassar and Bali, who ultimately export the fish to Hong Kong (Wisesa et al., 2016b).

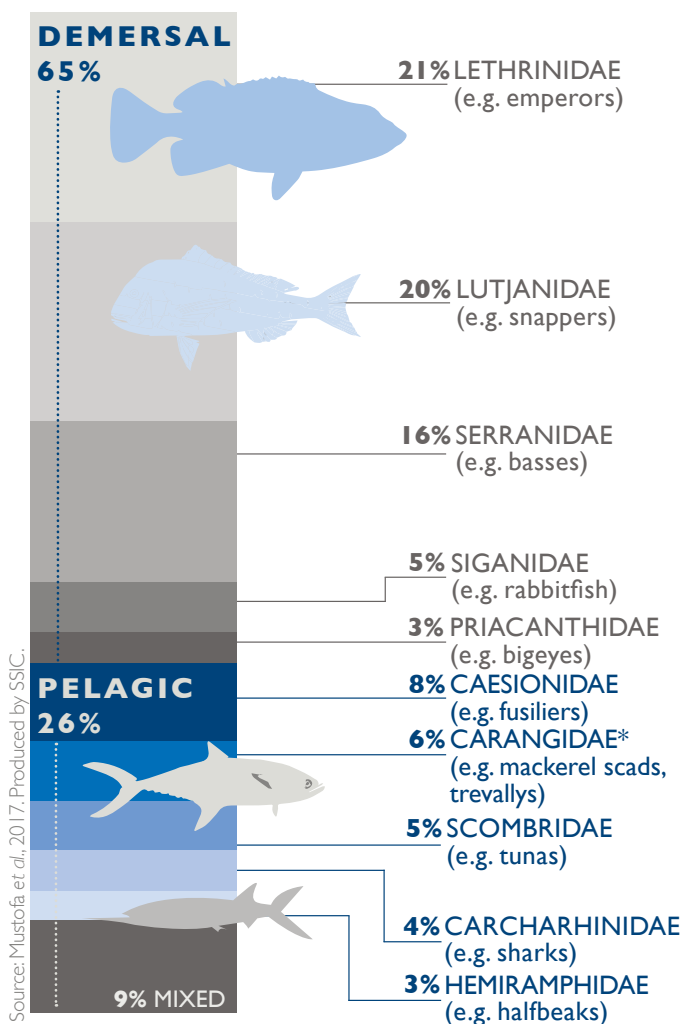
With pelagic sales, the local collectors tend to only sell on to Ambon, where the fish are separated by quality. Lower-grade fish are sold locally to markets and restaurants, and higher-grade fish are sold on to Bali and Makassar, from where they tend to be exported to Japan, Europe, or the USA (Wisesa et al., 2016b).

Studies have revealed that the difference between the price received by fishers and the end consumer retail price is greater than 433 percent (Wisesa et al., 2016b). This suggests fishers receive low prices for their catches, which is reflected in the overall average income in the region, ranging from only 200,000 to 1,000,000 IDR/month (Wisesa et al., 2016b). In addition to the fishers' relatively low earnings, a range of other challenges undermine the sustainability of coastal fisheries in the area.

In the 1980s and continuing into the early 2000s, destructive fishing practices were commonly conducted in the waters of Sawai Bay, including bomb fishing and poison (potassium) fishing. This led to significant damage of reef habitat in some key fishery areas, not only from the immediate impacts of blast damage and poisoning, but also from the knock-on effects of a weakened ecosystem, leading to crown-of-thorns sea-star outbreaks and overall reduced resilience.

The destructive fishing practices conducted during this period also led to social conflict and unrest, particularly in the region of Pasanea. Here, communities rallied against the use of harmful practices in their waters perpetrated by fishers from other communities. This led to a supreme court ruling in 2008, whereby Pasanea was given control over their islands.

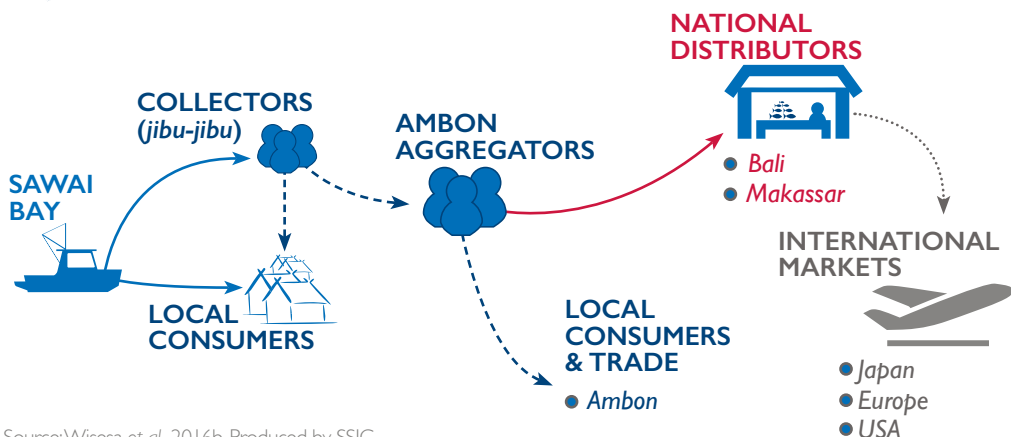
CATCH COMPOSITION IN SAWAI BAY



* This family can include both pelagic and demersal species; however, catch of *Carangidae* at Sawai Bay is dominated by pelagic variants of this family.



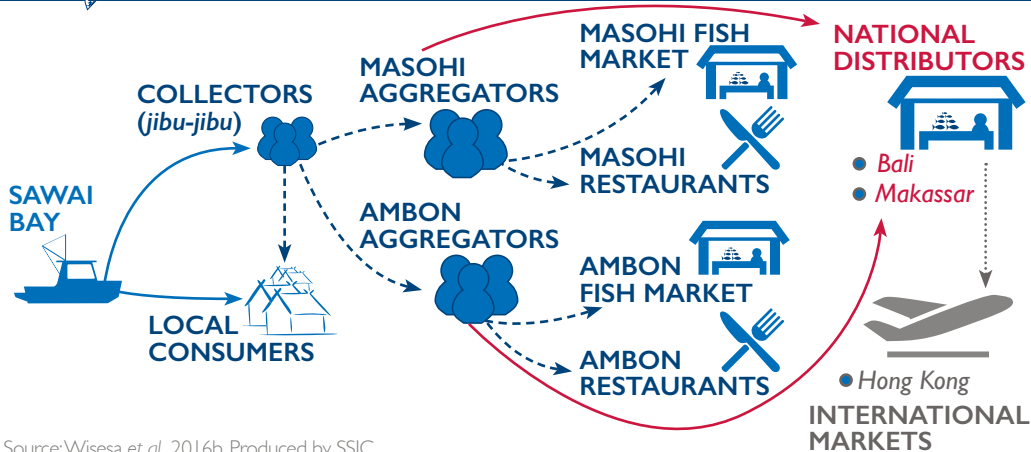
DOMESTIC & INTERNATIONAL SUPPLY CHAIN PELAGIC SPECIES – SAWAI BAY



Source: Wisesa et al., 2016b. Produced by SSIC.

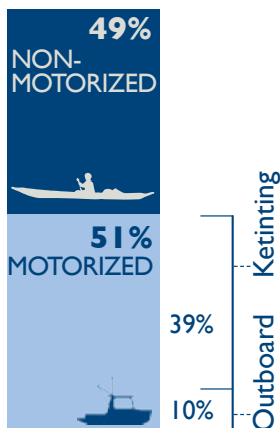


DOMESTIC & INTERNATIONAL SUPPLY CHAIN DEMERSAL SPECIES – SAWAI BAY



Source: Wisesa et al., 2016b. Produced by SSIC.

FLEET IN SAWAI BAY



While the scale of destructive practices has since reduced considerably, an estimated 70 percent of critical coral reef habitat is thought to have been damaged and will take many years to recover, which has a negative impact on the overall productivity of the marine waters and on fishers' potential livelihoods.

"Formerly, the coral reef here is good. Fishermen simply go to [Pasanea] briefly and can get many fish. Now not many anymore."

Fishing vessel owner [Anon], Sawai Bay

The lack of fishery infrastructure is another challenge faced by fishers in this region. Vessels are small and unable to travel far, and there are no fishing ports or cold storage facilities available. Household electrical supply is inconsistent (between 6 and 15

hours per day), and only 40 percent of households own any type of freezer (with very limited capacity). This means that sales must be made promptly to avoid spoilage, which weakens the fishers bargaining position.

Even when sales are made, further challenges are faced by the collectors taking the fish to the main markets of Masohi (4 to 5 hours by road) and Ambon (6 to 8 hours). Roads in disrepair can often extend the journey time, leading to spoilage and loss of earnings, and seasonally-affected fishing yields can result in journeys being made with very low stock to sell, limiting (or removing) any profit margins.

Finally, there is no marine conservation area in the region and no management practices are being implemented to promote sustainability. This undermines not only the future viability of fishery livelihoods, but also the tourism enterprises emerging across the bay (and the potential alternative livelihoods this industry may bring in the future), as the marine environment is one of the key draws for visitors to the region.

SAFEGUARDING SAWAI

To address these concerns, the USAID SEA Project began working in Sawai Bay in 2016 to assess the status of the area and to identify and develop community-led fisheries management interventions. Perception surveys¹¹ conducted during this period found that local communities had a strong sense that their marine resources were in good condition, despite the evidence of damage, while at the same time, 60 percent of respondents recognized that fish availability in the water had declined in recent years¹² (CTC, 2017b). The importance of coral reefs for fisheries and shoreline protection appears well understood in the region, and with a growing tourism industry, there is recognition that the marine environment plays an important part in this liveli-

AQUACULTURE IN SAWAI BAY

In addition to capture fisheries, aquaculture operations are active in the bay. This includes approximately 330 shrimp farming plots (each covering an average 0.1 ha), which employ a combined total of up to 1,000 people. Cultivating white-leg shrimps (*Litopenaeus vannamei*), these operations use pellet feeds and appetite-enhancing drugs in the water, with regular marine siphoning to keep stock healthy. Harvesting is conducted three times a year, resulting in approximately 1,800 tons per harvest. Shrimps are generally sold through a shrimp distribution company based in Waihai, with a portion of the stock ultimately exported to Japan, China, and the USA (Wisesa *et al.*, 2016b).

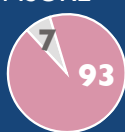
Grouper and lobster grow-out cages are also used in some areas of the bay where the currents and conditions are sufficiently calm. Employing approximately 20 individuals, the cages do not operate year-round (as they are highly affected by sea conditions) and generally rely on wild-caught seed stock.

These aquaculture operations bring both opportunities and challenges to the Sawai coastal communities. Opportunities are in the form of employment and livelihoods. Challenges are in the form of localized water pollution from the shrimp farms (causing increasing concern amongst residents across the region) and geo-social conflicts regarding the positioning of grouper and lobster grow-out cages, leading to inter-village disputes (Wisesa *et al.*, 2016b).

PERCEPTIONS OF THE MARINE ENVIRONMENT IN SAWAI

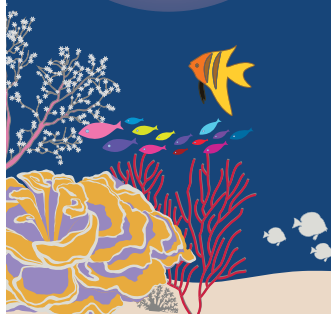
MARINE RESOURCES (%)

IN DECLINE / UNSURE



HEALTHY

98% respondents AGREE that CORAL REEFS PROTECT THE SHORELINE and PROVIDE FOOD & SHELTER FOR FISH



FISH CATCHES

IN DECLINE 60% HEALTHY 40%

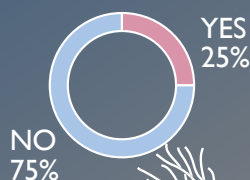


DESTRUCTIVE FISHING

DESTROYS CORAL REEF



IS LOCALLY COMMON



Source: CTC(2017b). Produced by: SSIC.

hood opportunity. However, from the surveys, the levels of understanding regarding the impact destructive fishing has on the marine environment was wavering, and a quarter of all respondents noted that destructive practices were still continuing on occasion in Sawai Bay's waters.

In 2017, discussions commenced regarding the potential establishment of an MPA in the bay. Initially proposed to cover only a few hundred meters around the Ora beach tourism area, it was soon realized that a larger MPA, covering the critical habitats of the area, would not only promote recovery of the region and subsequent restocking of fisheries, it would also protect the ETP species using the area, which is essential for ecosystem resilience and confers greater sustainable marine tourism appeal.

⁶ Six species of mangrove can be found in Sawai Bay: *Bruguiera gymnorrhiza*, *Ceriops tagal*, *Rhizophora apiculata*, *Rhizophora mucronata*, *Sonneratia alba*, and *Lumnitzera littorea*. Overall, mangroves cover a combined area of 1,678 ha (Mustofa et al., 2017; Sasi, 2017b; Wisesa et al., 2016b).

⁷ Six types of seagrass can be found in Sawai Bay: *Enhalus acoroides*, *Thalassia hemprichi*, *Cymodocea serulatta*, *Syringodium isoetifolium*, *Halophila ovalis* (the preferred food of the dugong), and *Halodule spp.* Overall, seagrasses cover a combined area of 471 ha (Mustofa et al., 2017; Sasi, 2017b; Wisesa et al., 2016b).

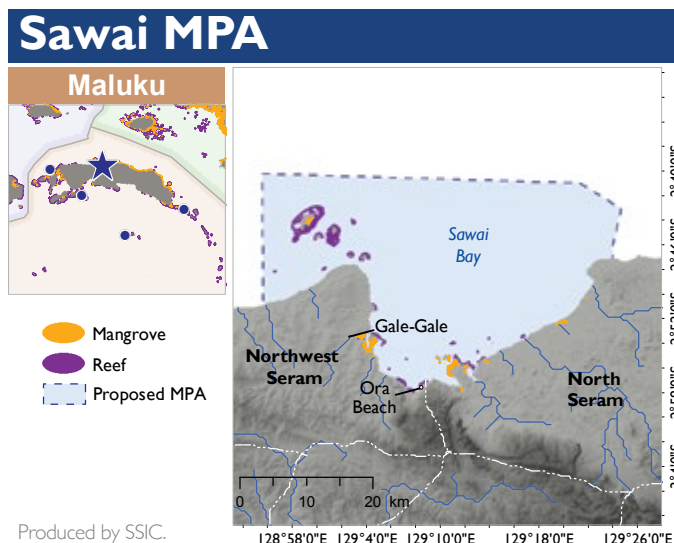
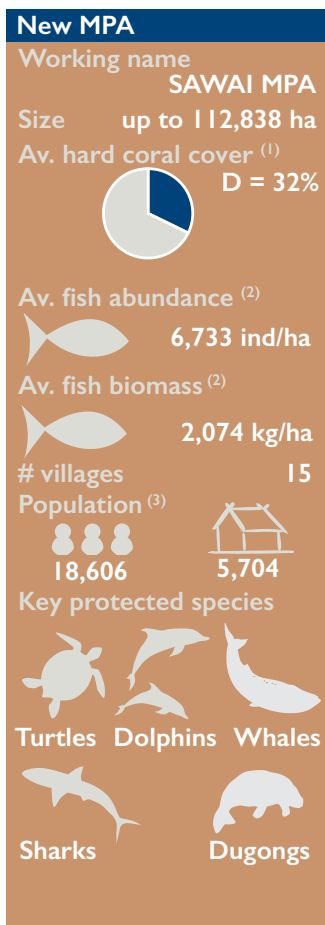
⁸ Key emperor species include: *Lethrinus lentjan*, *Lethrinus atsunkoni*, *Lethrinus obsoletus*, *Lethrinus harak*, and *Lethrinus erythropterus*.

⁹ Key snapper species include: *Lutjanus gibbus*, *Lutjanus madras*, *Lutjanus kasmira*, *Pinjalo pinjalo*, *Lutjanus carponotatus*, *Lutjanus ehrenbergii*, and *Lutjanus argentimaculatus*.

¹⁰ Key grouper species include: *Ephinephelus quoyanus*, *Ephinephelus faviatus*, *Anyperodon leucogrammicus*, *Epinephelus merra*, *Epinephelus fuscoguttatus*, *Chepalopolis boenak*, *Ephinephelus oncus*, *Chepalopolis aurantia*, and *Plectropomus leopardus*.

¹¹ Stakeholder respondents in perception monitoring: total = 40. Fisherman (n = 16), civil servant (n = 12), unemployed (n = 6), other (private sector, part time / contract workers, teachers, and seasonal fishers) (n = 6). 78 percent male, 23 percent female. The majority (53 percent) earn less than 1 million IDR/month. Note: the scale of the study only provides an insight into perceptions and does not represent the entire area in a statistically robust fashion.

¹² Species considered difficult to find in recent years include: hairfin anchovy (*Thrissina baelama*), chocolate hind (*Cephalopoholis boenak*), Spanish mackerel (*Scomberomorini spp.*), orange-lined triggerfish (*Balistapus undulatus*), and bigeye trevally (*Caranx sexfasciatus*).



Current management effectiveness ranking: 0



The proposed Sawai MPA will potentially cover an area of more than 112,000 ha, with EAFM fisheries management principles integrated into MPA design and development.

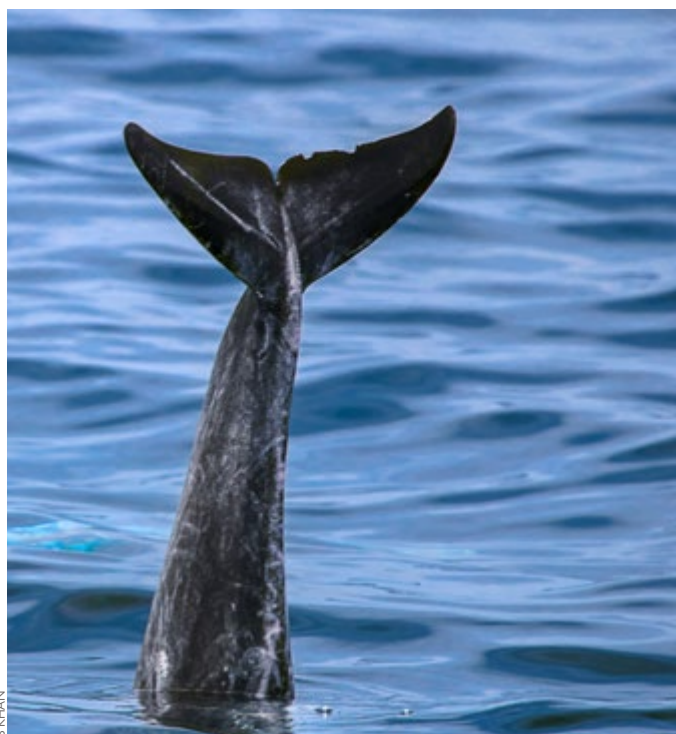
¹ Based on 50m PIT x 3 replicates. S = shallow (< 4m), D = deep (10m). n = 25 sites. Substrates = 7 categories (Mustofa *et al.*, 2017).

² Based on UVC belt transects (50 x 5m). Fish abundance ranged from lowest 650 ind/ha in Lisabata Timur village to highest 24,670 ind/ha in Parigi village. Biomass ranged from lowest 303 kg/ha in Sawai Island to highest 5,360 kg/ha in Wwalakone village (rounded data; Mustofa *et al.*, 2017).

³ BPS, 2011.

Right: Sawai MPA will protect a range of megafauna

Far right: cage aquaculture in Sawai



SUPPORT TO MPA ESTABLISHMENT

STEPS TO EFFECTIVE MPA MANAGEMENT SUPPORT (2016-2021)									
Level 1		Level 2		Level 3		Level 4		Level 5	
MPA proposed		Inventory & area ID		Reservation of area		Management unit & personnel		Management & zoning plans	
				Facilities & infrastructure		Management funding			
				Plans approved		Management (SOPs)		Plans implementation	
				Designation (legal) of MPA					
				Boundary marking		Institutionalization		Resource management	
						Socioeconomics supported			
						Community welfare improved			
						Sustainable funding			
									Independent MPA
									Optimally managed MPA
									Minimally managed MPA
									Established MPA
									Initialized MPA

for a full description of the activities being implemented under each of these steps: see volume two, chapter three

Surveys undertaken in 2017 suggest there is already a strong awareness of the importance of MPAs; however, compliance with government regulations is regarded as very limited in the area (CTC, 2017b). Therefore, building trust and support for MPA implementation as well as developing collaborative management mechanisms will be essential in the coming years.



Perceived compliance with marine & coastal regulations



Key behavior changes anticipated through this work:

- Willingness to engage in MPA design and planning
- Willingness to comply with MPA zoning, including no-take zones
- Adoption of sustainable tourism best practices for visitor management
- Willingness to comply with marine and coastal regulations

Target audiences: Fishers, aquaculture operators, collectors, community members, government

Key capacity-building support areas provided:

- Resource mapping, management planning, and MPA zoning
- Collaborative community-driven MPA management
- Sustainable tourism best practices

Target audiences: Fishers, aquaculture operators, collectors, community members, government



SUMMARY USAID SEA PROJECT SUPPORT

SUPPORT FOR WIDER EAFM ACTIVITIES TO PROMOTE SUSTAINABLE FISHERIES

UNDERTAKING FISHERY ASSESSMENTS

Undertaking assessments for demersal fisheries in the bay. Utilizing an I-Fish-compatible software to synchronize data management with the government fishery database.

STOCK
ASSESS

I-FISH

IMPLEMENTING FISHERY INTERVENTIONS

Contributing to the development of a fisheries management plan using EAFM (based on the EAFM indicators provided by the MMAF), including the establishment of locally-managed areas; identifying and implementing support for market access.

INPUT &
OUTPUT
CONTROL

MARKETS

MONITORING, EVALUATION & MANAGEMENT

Trialing small-scale fisher logbooks, promoting vessel registration, and establishing community surveillance groups (*pokmaswas*) on the ground.

LOG
BOOKS

VESSEL
REG

FISHER
CARDS

for a full description of these activities: see volume two, chapter four

Surveys undertaken in 2017 showed there is already a level of willingness amongst the local communities to refrain from undertaking destructive practices and to report any destructive acts observed. Respondents were also generally willing to avoid juvenile fish and ETP species consumption. However, more work is required to ensure overall engagement in fishery management assessments and interventions in the bay.

Commitment to report destructive practices



Commitment to avoid consuming juvenile fish



Commitment to avoid using destructive practices



Commitment to avoid consuming ETP species



Therefore, key behavior changes anticipated through this work:

- Consolidated awareness and willingness to stop destructive practices
- Willingness to comply with fishery regulations, complete log-books, and register vessels
- Willingness to engage / participate in community surveillance

Target audiences: Fishers, aquaculture operators, community members, collectors

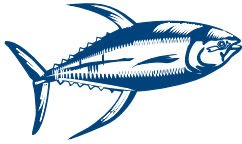
Key capacity-building support areas provided:

- Sustainable fisheries management
- Locally-managed fishery grounds
- Collaborative fishery management cross-sectorally
- Logbook usage and SIMKADA

Target audiences: Fishers, community members, collectors



THE PELAGICS OF PARIGI



The Wahai area (population 11,000) is just east from Sawai Bay, in the sub-district of North Seram. Wahai is known for its tuna fishing, particularly in the hamlet of Parigi (Dusun Parigi) (Timur, 2017).

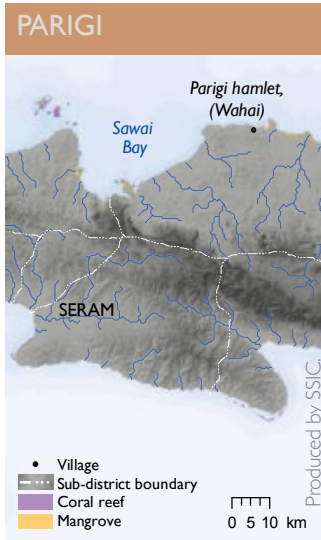
Parigi is situated at sea level, where flooding during spring high tides is only avoided due to the presence of sea barriers (*tallit*) constructed by the government. Ninety percent of the workforce in Parigi are involved in the tuna fishing industry, with some fishers supplementing their income through farming or livestock. Agriculture in the region is dominated by cloves, cocoa, and coconut.

A total of 200 tuna fishers reside in Parigi, all of whom own their own vessels (which is unusual for most coastal communities in this region), with loans for vessel purchase sometimes provided by collectors and middlemen. These craft are small (seven to ten meters; one GT), and nearly all of them are motorized, with either inboard or outboard motors (including *ketinting* engines). Fishers generally operate alone, with crews of two only in peak fishing season (Timur, 2017).

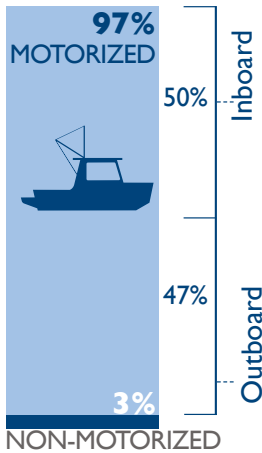
The target catches are solely yellowfin tuna (*Thunnus albacares*) and skipjack tuna (*Katsuwonus pelamis*), with fishers using either hand lines or troll lines. Peak seasons for the fishers (when yields tend to be at their greatest) are between March and May, and again between October to December, with lower yields generally recorded in July and August (this is also when fishers have observed more juvenile tunas in the waters, suggesting this may be an important breeding period).

Many of the fishers rely on FADs; there are approximately 20 FADs situated offshore from Parigi. These are generally home-made, constructed out of bamboo, ropes, and coconuts. Fishers use small GPS units to reach the FADs and can catch between 25 to 150 kg of fish per trip (with fishers generally making up to 20 trips per month) (Timur, 2017).

These fish are landed at local beaches (as Parigi has no landing site infrastructure), where the larger, more valuable fish are bought by collectors. Fishers are not beholden to any particular collector, giving them the freedom to negotiate price per catch. However, with no ice production facilities in the area, and with household refrigeration systems powered only 50 percent of the time (as electricity is only supplied to Parigi at night), time is of the essence, and sales need to be made efficiently to avoid wastage.



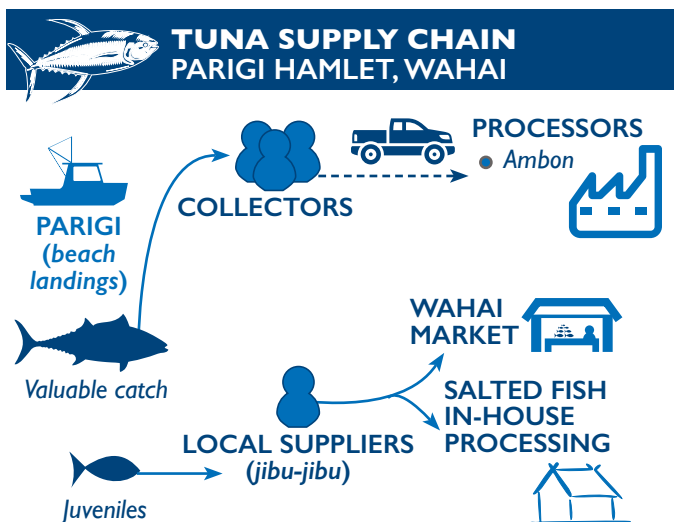
PARIGI FLEET



Left: tuna for sale at market
Over page: fishers at sea in Maluku

These collectors then store the fish in ice boxes until the stored volume reaches approximately one ton, after which the fish are transported by car to processors in Ambon. This usually occurs every two to three days (Timur, 2017).

Smaller fish (juveniles) that are also caught by the fishers tend to be sold to local suppliers (*jibu-jibu*) who then retail the fish locally (in Wahai market) or process them to become salted fish (*ikan asin*).



Source: Timur, 2017. Produced by SSIC.

Based on surveys conducted in Parigi in 2016, fish catch has been relatively stable over recent years, despite on-going catches of juveniles. However, fishers are noting that there is an increasing presence of outside fishers coming to the area. Additionally, FADs are having to be positioned further out to sea to attract fish (requiring the fishers to travel greater distances), suggesting early signs of overfishing may be starting to appear.

In addition to this, fishers admitted to some levels of bycatch, including silky sharks (*Carcharhinus falciformis*) which they then sell on for local consumption. Other ETP species that are often seen include whales, dolphins and turtles, with illegal turtle eggs often found at the local markets.

PROTECTING PARIGI

In 2016, the USAID SEA Project began working with Parigi fishers to promote sustainable marine and coastal management through the introduction of Fair Trade principles. 'Fair Trade' is both a concept and a brand through which the primary providers of commodities (i.e. Parigi tuna fishers) commit to ensuring their products are sustainably managed / sourced in exchange for earning a fair and reliable market price.

End-line consumers meanwhile pay a premium for the sustainably-managed products in recognition of fair pricing and as their own contribution to a more equitable world.

To this end, the concept of Fair Trade has been extensively socialized in the region, and two fisher associations have been established (as required for Fair Trade). These associations (Tuna Parigi and Tuna Pantura) are based upon FAD ownership groups, and between them they already have a



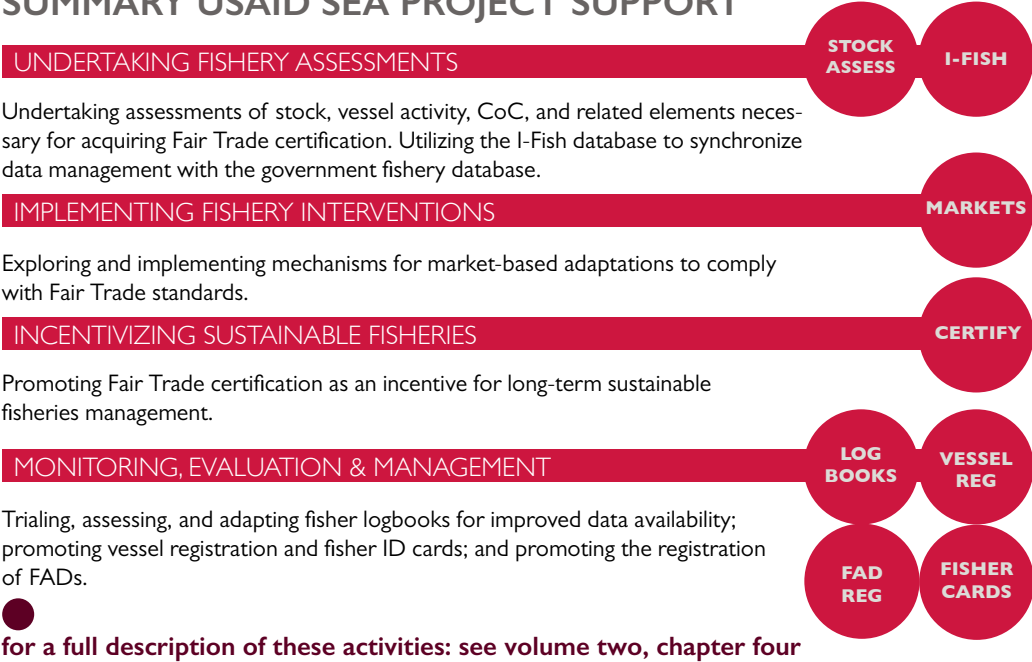
membership of 54 fishers. In addition to this, a Fair Trade committee is in the process of being established, with the engagement and involvement of the pre-existing Tuna Kooperasi of Parigi, resulting in Fair Trade principles and processes reaching 93 percent of all tuna fishers in the region (Timur, 2017).

The steps required to achieve Fair Trade certification are complex and multifarious and will require considerable work in the coming years. To date, work is underway to complete the numerous assessments required to fully comprehend the fishery, from undertaking stock assessments to reviewing processing facilities, measuring impacts on ETP species, and thoroughly mapping the supply chain in order to develop a clear chain of custody (CoC) for the tuna being traded.

Work is also underway to provide the extensive capacity-building support that implementing Fair Trade will require. To date, this has included training on logbook usage, vessel (SIMKADA) and FAD registration systems, as well as awareness raising on the importance of protecting ETP species and an initial deployment of circle hooks for fishers to use (that help avoid the accidental capture of ETP species, particularly turtles).

Moving forward, support will continue to be provided with the aim of achieving future Fair Trade certification.

SUMMARY USAID SEA PROJECT SUPPORT



Key behavior changes anticipated:

- Adoption of data-tracking measures (logbooks, CoC processes) in compliance with Fair Trade requirements
- Understanding about and potential adoption of circle hooks for reduced bycatch and injury of ETP species
- Increased recognition of the value of healthy marine resources for livelihoods
- Willingness to comply with Fair Trade-related restrictions and requirements

Target audiences: Fishers, collectors, processors, distributors, exporters, government agencies

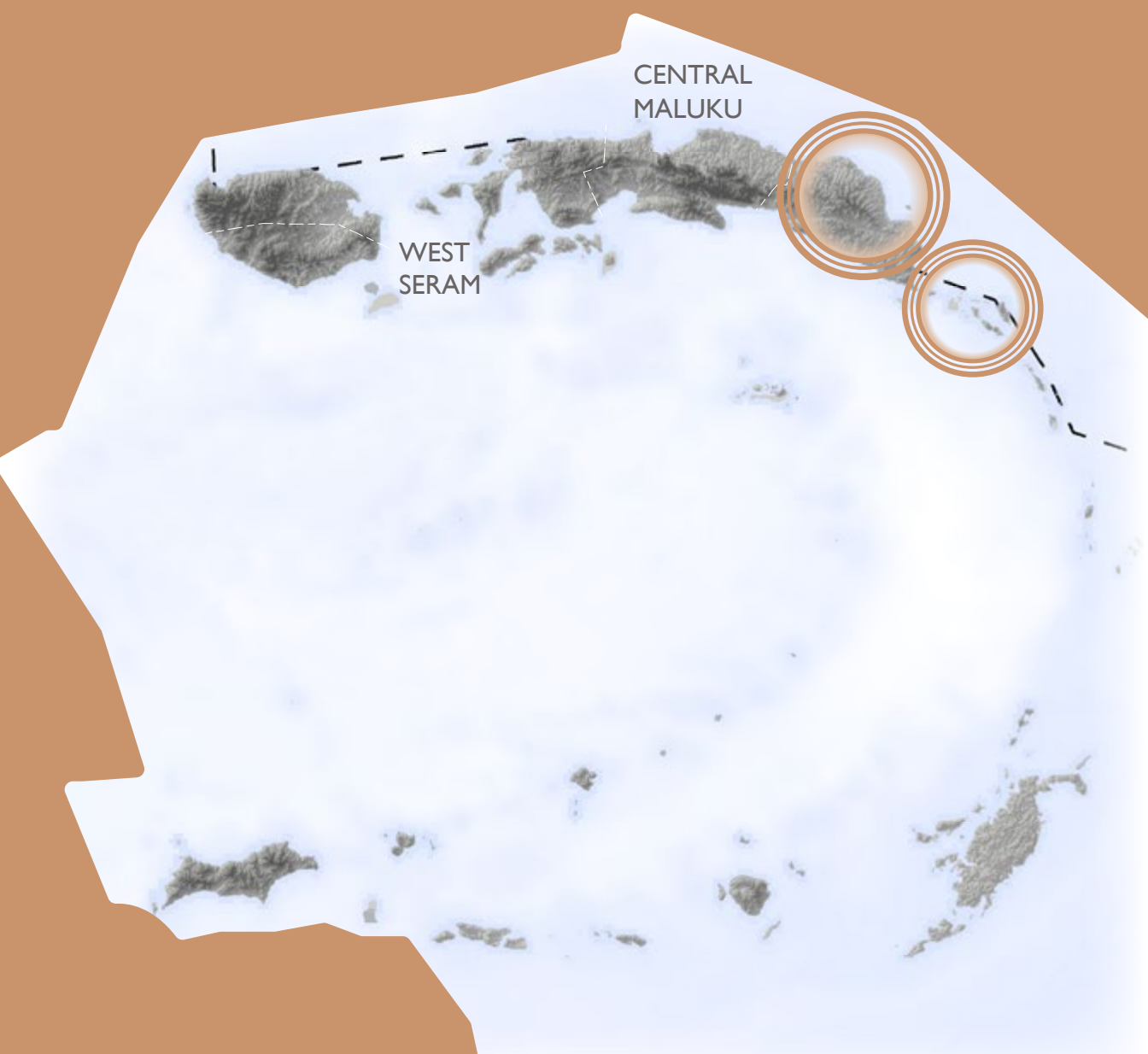
Key capacity-building support areas provided:

- Sustainable fisheries management
- Logbook and associated monitoring activities
- CoC processes and associated documentation requirements
- Tuna handling and gear deployments for sustainable management

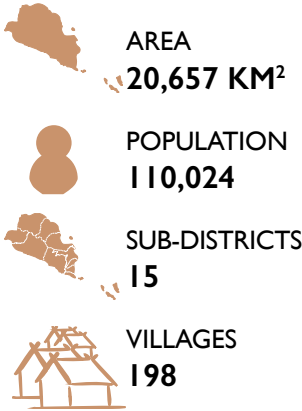
Target audiences: Fishers, collectors, processors, distributors, exporters, government agencies.

● see page 66 to learn more about circle hooks

EAST SERAM



The East Seram regency covers the eastern area of the large Seram Island and 49 smaller islands off the coast (BPS Kabupaten Seram Bagian Timur, 2017). The USAID SEA Project is supporting activities in two of the fifteen sub-districts of this region: Bula and the Gorom Islands.

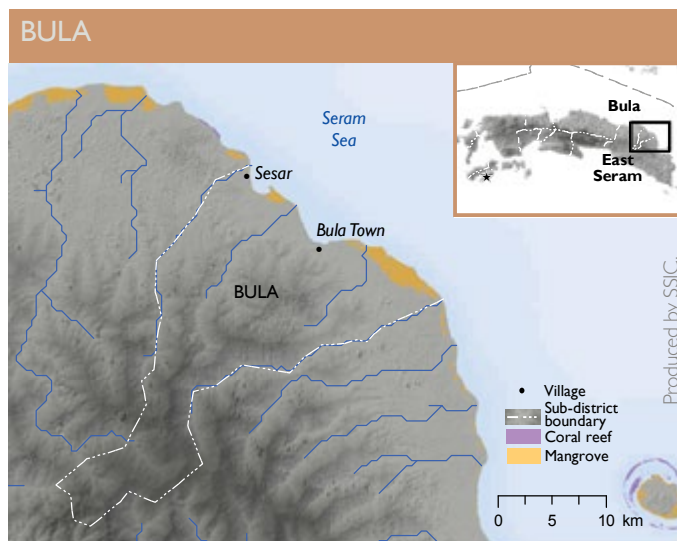
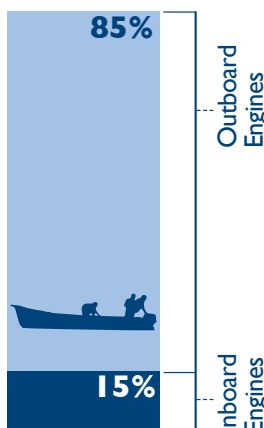


Source: BPS Kabupaten Seram Bagian Timur, 2017.

Below: spectacular landscapes are found throughout Maluku



BULA TUNA FISHING FLEET



THE TUNA OF BULA

The Bula sub-district has a total population of 16,305 people, with an estimated 126 households in the region involved in fisheries (BPS Kabupaten Seram Bagian Timur, 2017). In addition to the main town of Bula, there are 10 key villages in the area, one of which is Sesar village.

Sesar is located just north of Bula town. Fishing is the main livelihood for the majority of working-age people, with 120 active fishers living in the area, some of whom supplement their income with farming or livestock growing (Timur, 2017).

Though located only a 15 minutes' drive from the nearby town, Sesar is a rural coastal village, with fishers catching a range of demersal and pelagic species to supply the main town of Bula. However, the main target catch of the region is yellowfin tuna (*Thunnus albacares*) and skipjack tuna (*Katsuwonus pelamis*), with 100 percent of the fishers using FADs. This tuna fishery is exploited not only by local Sesar fishers, but also by fishers from West Seram, Sanana, Ambon, and even as far away as Sulawesi. For many years, these nomadic fishers have set up temporary camps in the region during high season (when tuna catches are at their greatest), returning to their homes after the fishing season. In recent years, however, the head of Sesar village, recognizing the boost to local economy these nomadic fishers were bringing, invited them to join the community, providing land for them to build homes. This has led to the construction of semi-permanent dwellings in the mangrove area of Sesar (resulting in a one-hectare fisher village) (Timur, 2017).

A total of 27 tuna fishing vessels operate in these waters, with 96 percent of the fishers using hand lines and troll lines. Some vessels use more than one gear at a time; other gears used include gill nets (22 percent) and spears (35 percent).

Fishery infrastructure in the region is lacking. One auction house has been constructed but is not yet active. Landings take place along the beaches, where sales are made to collectors (*jibu-jibu*) who sell on to the local markets and mini-plants in Bula. Storage facilities locally are very limited, with only household freezers available, meaning catches need to be sold quickly to avoid wastage. This gives collectors considerable purchasing power, sometimes resulting in fishers receiving less than optimal rates of pay for their catches.

PERCEPTIONS OF THE MARINE ENVIRONMENT IN BULA

MARINE RESOURCES (%)

IN DECLINE / UNSURE



95% respondents AGREE that CORAL REEFS PROTECT THE SHORELINE and PROVIDE FOOD & SHELTER FOR FISH



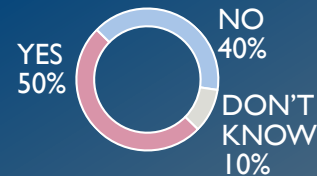
FISH CATCHES

IN DECLINE

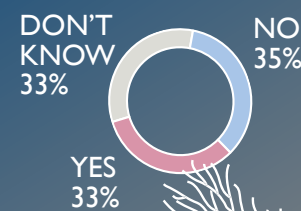


DESTRUCTIVE FISHING

DESTROYS CORAL REEF



IS LOCALLY COMMON



SOURCE: CTC, 2017b. Produced by: SSIC

WWF / A MUSTOFA

Based on interviews conducted in 2016, catches have remained relatively stable over the years, though some fishers complain of having to travel further to catch fish (Kochen, 2017). Other studies in the region have revealed a sense that local marine resources have been degraded, and 68 percent of respondents in one survey felt that fishing catches were better in the past compared to the present (CTC, 2017b).

Therefore there is a need to promote sustainable fisheries management in the region to ensure catches remain optimal (and viable) into the future and support more equitable revenue-generation opportunities for fishers.

Below: hand lines and trolling lines



WWF / A MUSTOFA

SUSTAINABLY MANAGING THE BULA TUNA FISHERY

In 2016, the USAID SEA Project began working with the fishers of Sesar to promote sustainable marine and coastal management through the introduction of Fair Trade principles. Similar to the work conducted in Parigi (see page 118), the concept of Fair Trade has been extensively socialized in the region, and one fisher association has been established (as required for Fair Trade): Tanjung Sesar. In addition to this, a Fair Trade committee is in the process of being established (Timur, 2017). Work is underway to complete the numerous assessments required to fully comprehend the fishery, from undertaking stock assessments to reviewing the Bula-based processing facilities, measuring impacts on ETP species, and thoroughly mapping the supply chain in order to develop a clear chain of custody (CoC) for the traded tuna.

Work is also underway to provide the extensive capacity-building support required to implement Fair Trade. To date, this has included training on logbook usage, vessel (SIMKADA) and FAD registration systems, awareness raising on the importance of protecting ETP species that may be caught as accidental bycatch, and deploying circle hooks for fishers to use (to help avoid the accidental capture of turtles).

Moving forward, support will continue to be provided with the aim of achieving future Fair Trade certification.

see page 66 to learn more about circle hooks

SUMMARY USAID SEA PROJECT SUPPORT

UNDERTAKING FISHERY ASSESSMENTS

Undertaking assessments of stock, vessel activity, CoC, and related elements necessary for acquiring Fair Trade certification. Utilizing the I-Fish database to synchronize data management with the government fishery database.

STOCK
ASSESS

I-FISH

IMPLEMENTING FISHERY INTERVENTIONS

Exploring and implementing mechanisms for market-based adaptations to comply with Fair Trade standards.

MARKETS

INCENTIVIZING SUSTAINABLE FISHERIES

Promoting Fair Trade certification as an incentive for long-term sustainable fisheries management.

CERTIFY

MONITORING, EVALUATION & MANAGEMENT

Trialing, assessing, and adapting fisher logbooks for improved data availability, promoting vessel registration (SIMKADA) and fisher ID cards, and promoting the registration of FADs.

LOG
BOOKS

VESSEL
REG

FISHER
CARDS

FAD
REG

Key behavior changes anticipated:

- Adoption of data-tracking measures (logbooks, CoC processes) in compliance with Fair Trade requirements
- Adoption of circle hooks for reduced bycatch and injury of ETP species
- Increased recognition of the value of healthy marine resources for livelihoods
- Willingness to comply with Fair Trade-related restrictions and requirements

Target audiences: Fishers, collectors, processors, government agencies

for a full description of these activities: see volume two, chapter four

Key capacity-building support areas provided:

- Sustainable fisheries management
- Logbook and associated monitoring activities
- CoC processes and associated documentation requirements
- Tuna handling and gear deployments for sustainable management

Target audiences: Fishers, collectors, processors, government agencies

CONSERVING KOON-NEIDEN

The Gorom Islands sub-district is located off the southeast tip of Seram Island and comprises three large islands and several smaller islands, which together cover an area of more than 91 km² (BPS Kabupaten Seram Bagian Timur, 2017). Three of these small islands (Koon, Grogos and Nukus) as well as Neiden island in the neighboring Geser sub-district, have long been recognized for their exceptional marine biodiversity.

The rich coral reef ecosystems of these islands play an important role in larvae recruitment and replenishment for neighboring coral reef systems throughout the Seram region. The seagrass beds support both dugongs and all six species of turtle known to exist in Indonesia have been historically recorded in these waters: the green turtle (*Chelonia mydas*), hawksbill turtle (*Eretmochelys imbricata*), olive ridley turtle (*Lepidochelys olivacea*), loggerhead turtle (*Caretta caretta*), flatback turtle (*Natator depressus*), and featherback turtle (*Dermochelys coriacea*) (Wisesa et al., 2016a).

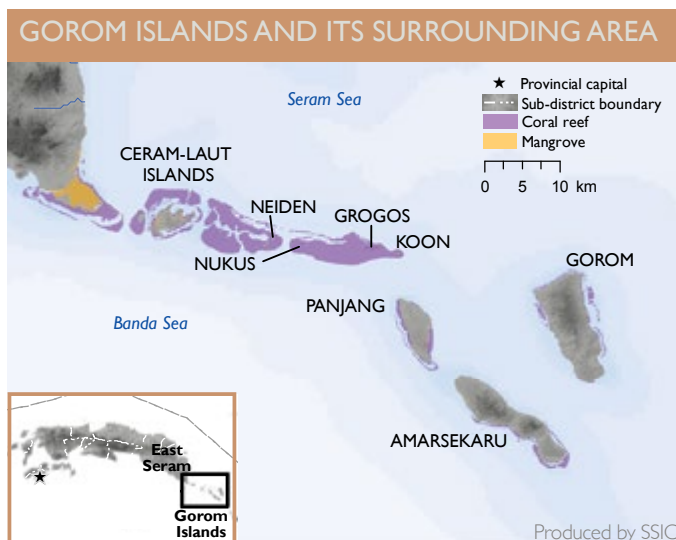
The region is an important migratory route for a wide range of cetaceans, including killer whales (*Orcinus orca*), false killer whales (*Pseudorca crassidens*), pygmy killer whales (*Feresa attenuata*), sperm whales (*Pyseter macrocephalus*), and the mighty blue whale (*Balaenoptera musculus*). Dolphins also regularly frequent these waters, and whale sharks are occasionally observed (Wisesa et al., 2016a).

Since the 1980s, this area has been a transit location for liveboards visiting Raja Ampat, Banda, and Ambon. However, there is no tourism infrastructure on the islands themselves, meaning that visitors remain on their boats and rarely venture to land (Wisesa et al., 2016a).

The population of this region is distributed across 13 small sub-villages, the majority of which are located on Gorom and Panjang Islands (home to approximately 31,658 residents) (Wisesa et al., 2016a). Across the region, the dominant livelihood is farming, with nutmeg and olives being the two most common products from the area. However, in the communities situated along

the coastlines, fishing is the dominant livelihood (involving an estimated 61 percent of working-age adults) (Korebima et al., 2015).

Fishery targets vary widely, with small-scale fishers extracting a range of fish and non-fish species. Demersal species caught in these waters commonly include emperors (*Lethrinidae*), groupers (*Serranidae*), snappers (*Lutjanidae*), rabbit fish (*Siganidae*), parrot fish (*Scaridae*), thread-fin bream (*Nemipteridae*), and fusiliers



MAXIMUM CATCH VOLUME PER TRIP*: KOON-NEIDEN

DEMERSAL

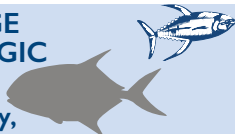
e.g. snappers, groupers



350 kg

LARGE PELAGIC

e.g. trevally, mackerel



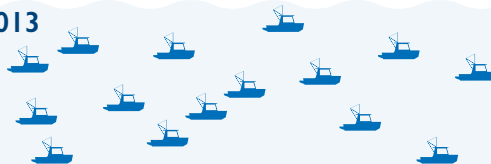
700 kg

* Catch figures shown are maximum yields recorded, i.e. the highest volumes recorded from the area in a single trip (period undefined). These figures do not reflect CPUE.

Source: Wisesa et al., 2017. Produced by SSIC.

SEASONAL INFLUENCE ON CATCH IN KOON-NEIDEN

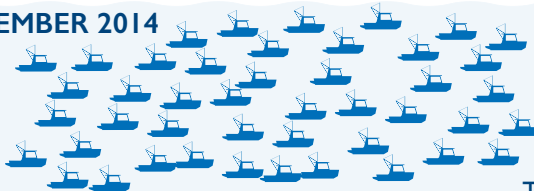
MAY 2013



15 TRIPS

0 TOTAL HARVEST → 6000 KG

NOVEMBER 2014



45 TRIPS

Source: Wisesa et al., 2016a. Produced by SSIC.

(*Caesionidae*). Pelagic species are also targeted, particularly trevally (*Carangidae*), mackerel (*Scombridae*), barracuda (*Sphyrnaenidae*), and bigeye tuna (*Thunnus obesus*). Non-fish species commonly gleaned include lobsters, sea cucumbers, and clams. Overall, a total of 22 target fish species from 14 families have been identified in this fishery.

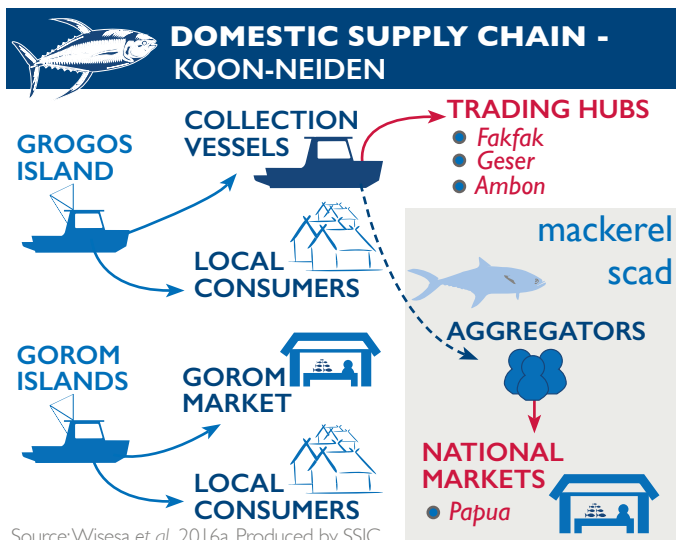
Total fishery production in East Seram district was estimated at 28,139 tons in 2016 (BPS Kabupaten Seram Bagian Timur, 2017), and Gorom region is estimated to contribute approximately 15 percent of this production (4,221 tons) (Wisesa et al., 2016a).

Gear types differ between fishing grounds. Around Grogos Island, the most commonly used gears are gill nets and small purse seines (70 percent of fishers), while closer to Gorom and Panjang the most commonly used gear type is hand lines (30 percent of fishers).

Seasons and weather conditions have a considerable impact on fishing activity in this region, with peak fishing periods able to yield up to three times as much catch per trip than low season.

Fisheries infrastructure in the area is very limited, with electricity only available overnight (6 pm to 6 am) limiting even home-based cold storage. Therefore, catches are generally used for subsistence, local sale door-to-door, sale to local small markets in Gorom, and to local collection vessels that have cold storage facilities onboard.

Sale at sea most commonly occurs in the Grogos area, where an association of fish collectors exists. Collection vessels generally trade the products on to Geser, Fakfak, or Ambon. Mackerel scads (*Decapterus macarellus*) are the only commodity sold to larger fish collectors for sale in regional markets in Papua (Wisesa et al., 2016a).



MANAGING THE MARINE AND COASTAL ENVIRONMENT OF KOON-NEIDEN

In the Koon-Neiden area, traditional resource management systems have been in existence for many generations. This is particularly the case in the territory of Kataloka, which includes four sub-villages (Adar, Rumeon, Dada sub-villages in Gorom Island, and Grogos sub-village on Grogos Island). This territory is overseen by a traditional king who plays an important role in the communities' social life. He is responsible for guiding traditional regulations and behaviors as well as resolving conflicts should they arise (Lismawati, 2015).

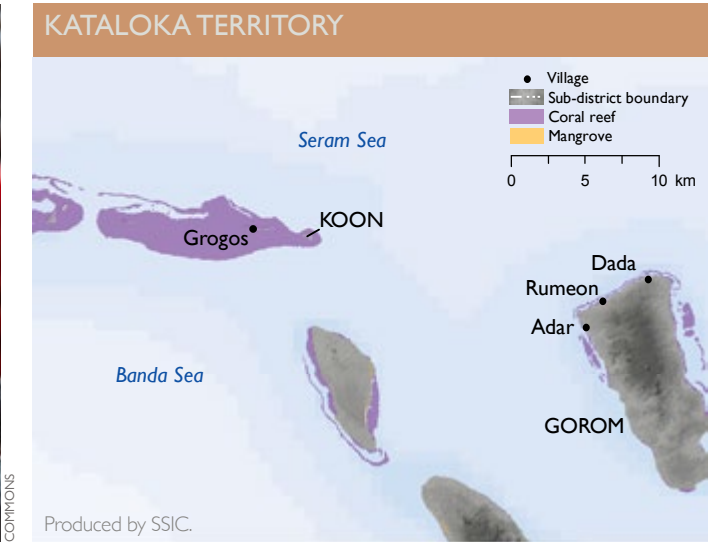
The King of Kataloka owns marine tenure rights (*hak ulayat laut*) for the entire Kataloka region but has portioned them out between the different communities. These tenurial arrangements determine the areas that fishers from different communities are permitted to fish. For example, intertidal areas may only be used (for gleaning and extracting species) by the community with the tenurial right to that area. Further out to sea, reef areas are also only utilizable by the community with the relevant rights to that area, while fishers from other communities are permitted to only fish the waters outside of the reef (Korebima et al. 2015; Wisesa et al., 2016a).

These tenurial divisions are generally demarcated using natural land markers (e.g. hills, rivers, peninsulas, and the like), and the communities understand where their access rights begin and end. If fishers from one community want to access another community's fishing area, they need express permission from the head of the sub-village concerned. Similarly, FADs can only be placed in a community's waters if special permission is sought.

Sasi systems are also operational in most of these sub-villages; intertidal areas are periodically closed to extraction activities, particularly with regard to clams, trochus shells, and sea cucumbers. In addition to this, the waters around Koon Island, known as a site of grouper spawning aggregations (SPAGs), have long been considered sacred by some of the community members, leading to some fishers avoiding activities in that area (Korebima et al. 2015).

Therefore, traditional mechanisms for marine and coastal management are strong in this region, and the customary systems in place offer considerable opportunity to combine science and sociology to promote a sustainable future for the area.

Below: dried sea cucumbers



However, the region is not without challenges. Studies conducted in the late 2000s and early 2010s revealed that the *sasi* areas being implemented were far from optimally managed, with sites remaining open for long periods of time and suffering from overharvesting, thus reducing yields and the perceived benefits of closure (Korebima, *et al.* 2015).

In addition to this, evidence was found of destructive fishing practices in the region (with some reef areas becoming rubble through the damage caused), and studies revealed illegal harvesting of ETP species sometimes taking place, particularly with regard to turtles, turtle eggs, and dugongs (Amkieltiela, 2016; Endropietro, 2016a; Endropietro, 2016b).

Finally, surveys in the region showed that the younger generation was becoming less interested in traditional management systems than their forebearers, a disinterest that could threaten the future viability of these customary arrangements.

To address these concerns, in 2011 the waters surrounding Koon Island (231 ha) were declared closed to all fishing and extractive practices through a marine conservation agreement (MCA) issued by the king. To secure these waters, the king also established routine patrols of the area four times each week, conducted by teams from Grogos Island (WWF–Indonesia, 2014). In the same year, the wider region stretching from Koon Island (Kataloka) across to Neiden Island (in neighboring *Petuanan* Kiltai) was declared an MPA through a formal East Seram Bupati decree (PerBup no. 523/189/KEP/2011), covering a total area of 9,940 ha.

In 2012, the king went on to issue a decree that banned the use of all destructive fishing practices (particularly poison and bomb fishing) throughout Kataloka's waters (decree no. 01/KEP-ADT/R-KAT/X/2012). The ban stipulates fines of up to 5 million IDR or 3 months' physical labor as punishment for any violators. Repeat offenders breaking the ban more than three times will be banished from the Kataloka region. Outsider fishers committing offenses are liable for fines of up to 15 million IDR, with mechanisms in place to dispatch the perpetrator(s) for prosecution at the national level.

The king also has the authority to issue regulations related to permissible fishing gears, input and output controls, and other management mechanisms to promote sustainability. Therefore, in the coming years, through support from the USAID SEA Project, efforts will be focused towards developing harvest-control systems locally with regard to demersal and small pelagic fisheries, which will complement the reserve management being implemented through the MPA as well as the traditional conservation area surrounding Koon Island. In addition to this, awareness-raising activities will be conducted to further promote the protection of ETP species.

WWF / F FIRMANISAH



Legal name
Kawasan Konservasi
Perairan Daerah Seram
Bagian Timur

Year est.
2011

Decree and status
Decree of the Mayor
East Seram no. 523/189/
KEP/2011

Management plan? ✖

Zoning plan? ✔
(informal)

Size
9,940 ha

Area of NTZ coverage
MCA area = 231 ha

Av. hard coral cover ⁽¹⁾

Av. fish abundance ⁽²⁾
4,298 ind/ha

Av. fish biomass ⁽²⁾
1,541 kg/ha

villages in MPA
1

Population ⁽³⁾
6,014

Key protected species
Turtles
Dugongs

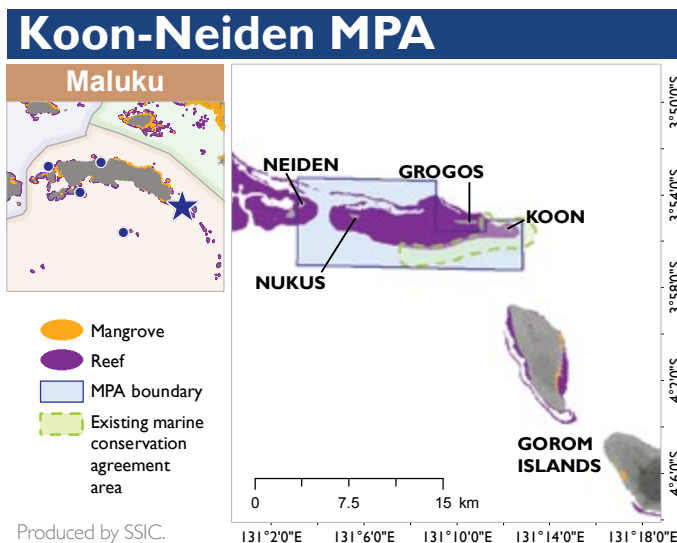
¹ Based on 50m PIT x 3 replicates. D = deep (10m). n = 21 sites (Prastowo and Amkieltiela, 2016).

² Based on UVC belt transects (250m), timed swims of 15 mins. Fish abundance was found to be 17 percent higher, and fish biomass more than 33 percent greater, inside the MPA compared to control site. The highest biomass inside the MPA is from *Caesionidae* family (389 kg/ha) followed by *Carangidae* (358 kg/ha) (Prastowo and Amkieltiela, 2016).

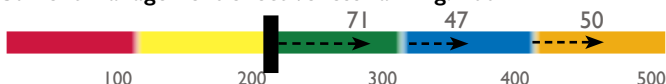
³ BPS, 2011.

Left: SPAG monitoring in Koon

Over page: marine tourism is increasing across Maluku, providing opportunities for additive and alternative livelihoods



Current management effectiveness ranking: 200

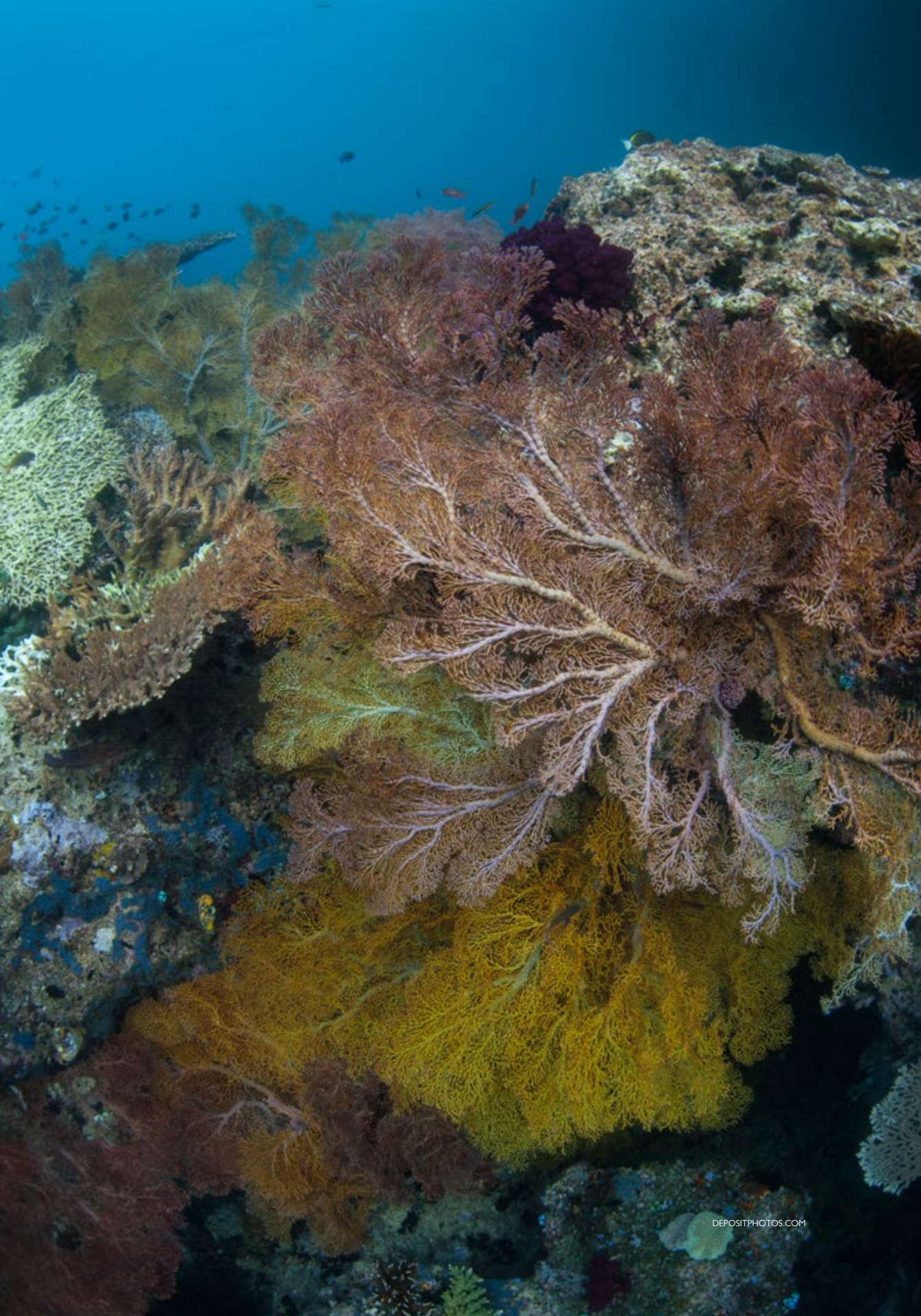


To date, the Koon-Neiden MPA has achieved two levels of effective management and is currently listed as minimally managed (level three). However, with MPA governance transitioning to provincial authorities (under law no.23/2014), clarity is needed in the coming months and years regarding the future management of the site, in order to further advance management effectiveness.

Under the draft spatial plan for Maluku, expansion of this MPA in coming years may also be possible (up to 152,237 ha), accompanied by socialization of the MPA's boundaries, as studies have revealed that many fishers are unsure where the boundaries are (Yusuf and Nurbandika, 2017).

In 2016, a payment for ecosystem services (PES) scheme was established in the MPA as a collaboration between a local community-based tourism operator, the king, and the liveaboard operators in the region, whereby tourism visitors pay a contribution to the MPA's management. In the coming years, this PES system will be further refined, through guidance from the king, with regard to optimal use of funds to support community development. In addition to this, further opportunities will be explored to develop sustainable marine tourism enterprises on the islands, to effectively capitalize on the region's stunning beaches, sites of historical interest, and marine environment. Such opportunities would provide additive or alternative livelihoods for community members, incentivize the protection of marine biodiversity, and promote sustainable management of the region.





CHAPTER 3

WEST PAPUA





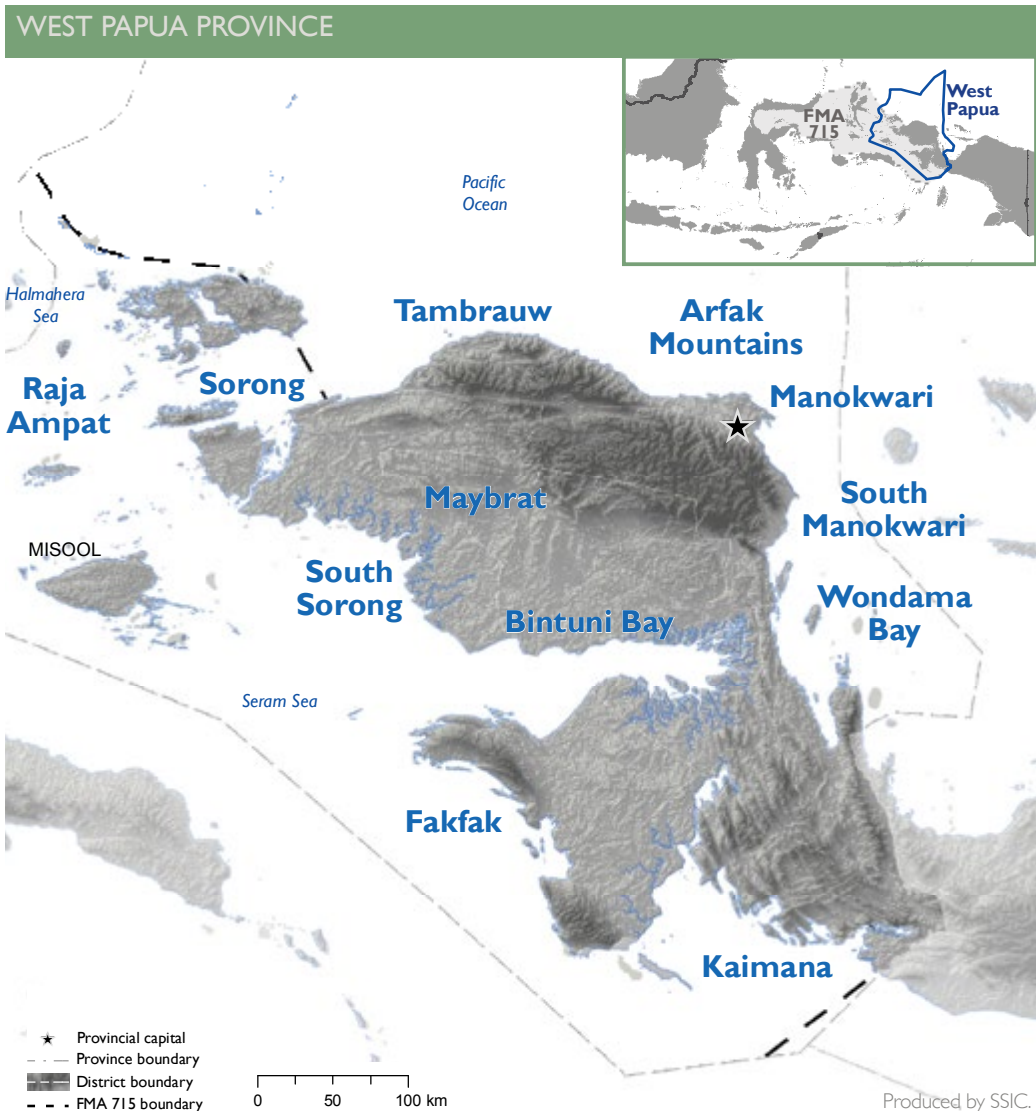
West Papua has the highest marine biodiversity in the world, with over 1,750 species of reef fish identified in the region.

The province of West Papua (*Papua Barat Provinsi*) is located in the far east of Indonesia. It covers an area of 120,777 km² and is divided into twelve districts / regencies (*kabupaten*) (Raja Ampat, Sorong, South Sorong, Bintuni Bay, Fakfak, Kaimana, Manokwari, South Manokwari, Wondama Bay, Tambrauw, Maybrat, and the Arfak Mountains) and one city / municipality (Sorong). These are further sub-divided into 218 sub-districts (*kecamatan*), 95 urban villages, and 1,744 rural villages (BPS Provinsi Papua Barat, 2017).



Previous page: coral sea fans in Raja Ampat

Left: West Papua seascape



Produced by SSIC.



J MORGAN

Famed for its marine and terrestrial biodiversity, West Papua is sometimes referred to as the 'conservation province'. The province is host to 9 million ha of forest, with 35 percent of its primary forest intact, and is estimated to hold 0.6 percent of the world's tropical forest carbon. Fifty percent of Indonesian fauna and flora are represented in the province, and sixty percent of the nation's endemic plants (found nowhere else on earth) can be found only in West Papua (CI, 2015).

The province is part of a marine area known as the Bird's Head Seascape (BHS), which is estimated to have up to 70 percent of the nation's mangrove forests and 75 percent of the world's hard (scleractinian) coral species represented in its waters (Katz *et al.*, 2015). More than 1,750 reef fish have been identified in these waters as well as critical nesting sites for turtles and feeding grounds for dugong; this makes West Papua the region with the highest marine biodiversity not only in Indonesia, but also in the world.

The province is host to a population of 893,362 people, 80 percent of whom live in rural areas and are highly dependent on natural resources for their livelihoods (BPS Provinsi Papua Barat, 2017; CI, 2015). The largest category of West Papua's workforce is defined as working in agriculture, forestry, hunting, and fishing (37 percent), with the next largest workforce focused on community and social services (26 percent) (BPS Provinsi Papua Barat, 2017). Key agricultural commodities from the region include oil palm, nutmeg, sago, coconut, and coffee (BPS Provinsi Papua Barat, 2017).

Traditional cultures and systems are strong in the region, with 12 major recognized tribes and hundreds of clans (culturally-connected collectives, comprised of family or *marga* groupings) (CI, 2015). Dozens of local languages and dialects exist, and residents of the area remain strongly connected to local customs for community and social governance.

The province is one of the poorest in Indonesia, with more than a quarter of the population (25 percent) living below the provincial poverty line of 474,965 IDR/month (BPS Provinsi Papua Barat, 2017). Adults have, on average, seven years of schooling, and of eligible school-age children in the region, only 62 percent are enrolled in school, with an estimated 25 percent of

WEST PAPUA AT A GLANCE

TOTAL AREA

120,777 km²



MARINE AREA

99,672 km² (18% of total)

POPULATION

~893,000



53%



47%

COASTAL POPULATION

~20%



KEY RELIGIONS

Protestant 54%

Islam 38%

Catholic 7%

Hindu & Others <1%

KEY LANGUAGES

Indonesian, Mpur, Yawa, Hatam-Mansim, Maybrat, Ternate, Burmeso

TIME ZONE

UTC+9



ADMINISTRATION

12 districts / regencies,

1 city, 218 sub-districts,

1,839 villages



Above: eco-resort in Raja Ampat

A BRIEF HISTORY OF WEST PAPUA

This region is thought to have been settled approximately 48,000 years ago by diverse Austronesian seafarers (Gillespie, 2002), and records from the 7th century document trade between West Papua and the Sumatra-based empire of Srivijaya (Singh, 2008). In 1545, the commander of a Spanish fleet (Ortiz de Retez) took possession of the area and its surrounding lands, referring to the entire region as Neuva Guinea. In 1660, authority was handed to the Dutch colonial powers. In 1793, Britain had a failed attempt at wresting control from the Dutch by establishing a settlement in Manokwari. However, even though the Dutch remained the dominant European presence, their influence in the area remained minimal, and numerous efforts to establish enclaves failed due to resistance from the indigenous peoples.

Up until the early 20th century, power tussles continued between British, Dutch, and German forces, linked in part to extensive missionary work that took place across the region, bringing Christianity to the area (Cribb and Kahin, 2004).

During World War II, the region was briefly occupied by Japanese troops (1942–44), resulting in extensive battles throughout the region between Japanese and Allied forces. Following the end of the war, the Dutch regained authority over the area, and when Indonesian became independent in 1945, it was with the exception of Papua, which remained under formal Dutch control until 1962. Throughout this period, however, the region was increasingly attaining independence internally, with the first democratically-held local elections taking place in 1955 (Thio, 2006).

In the 1960s, following continued determination from Indonesia to incorporate the region under its territory, the UN-mediated New York Agreement was developed through which Papuan citizens could vote whether to join Indonesia or become independent. This vote took place amidst much controversy in 1969, when the 1,000 elected representatives unanimously voted to join Indonesia (Cribb and Kahin, 2004; Thio, 2006). To this date, there is dispute over this decision, and a resistance movement for independence remains active in the region.

The province of West Papua was created from a portion of western Papua in 2003 and was named Papua Barat (West Papua) in 2007 (RNZ Pacific, 2007).

those enrolled not in regular attendance. Many youths leave education early to join their family workforce, particularly in farming and fishing areas (BPS Provinsi Papua Barat, 2017).

In recent years, a new emerging workforce has also been developing in the region for retail, trade, tourism, and hospitality, with tourism increasing rapidly in the area. This is particularly the case in Raja Ampat, where an estimated 15,000 tourists arrive annually (of which 60 percent are international visitors): the region has experienced a 30 percent annual growth rate in tourists between 2008 and 2014 (Pirovolakis, 2017; Katz *et al.*, 2015; Wardhana, 2017).

The vast majority of these visitors are drawn to the area by the spectacular marine environment, with liveaboard diving operations the most common form of high-end visitation to the region.

EXISTING MPAs IN WEST PAPUA (2016)

DISTRICT / REGENCY	SHORT NAME	FULL NAME	SIZE (HA)
RAJA AMPAT	West Waiego MPA	Suaka Alam Perairan Waiegeo sebelah Barat dan Laut Sekitarnya	271,630
	Current management effectiveness ranking: 200 [♦]		
	Raja Ampat Marine Conservation Area	Kawasan Konservasi Perairan Raja Ampat, including:	1,026,540
	<i>Ayau-Asia MPA</i>	<i>Area I, Perairan Kepulauan Ayau-Asia</i>	~101,440
	<i>Mayalibit Bay MPA</i>	<i>Area II, Teluk Mayalibit</i>	~53,100
	<i>Dampier Strait MPA</i>	<i>Area III, Selat Dampier</i>	~336,000
	<i>Misool Islands MPA</i>	<i>Area IV, Perairan Kepulauan Misool</i>	~366,000
	<i>Kofiau and Boo Islands MPA</i>	<i>Area V, Perairan Kepulauan Kofiau dan Boo</i>	~170,000
	Current management effectiveness ranking: 300 [♦]		
	Raja Ampat Marine Nature Reserve	Suaka Alam Perairan Kepulauan Raja Ampat dan Laut Sekitarnya	60,000
	Current management effectiveness ranking: 200 [♦]		
KAIMANA	Kaimana MPA	Kawasan Konservasi Laut Daerah Kabupaten Kaimana	597,747
	Current management effectiveness ranking: 100 [♦]		
FAKFAK	Sabuda Tataruga MPA	Suaka Margasatwa Pulau Sabuda Tataruga	5,000
	No management effectiveness ranking		
WONDAMA BAY*	Cenderawasih National Park	Taman Nasional Laut Teluk Cenderawasih	1,453,500
	MEF ranking: 64% [†]		
TAMBRAUW BAY*	Jamursba Medi MPA	Suaka Margasatwa Laut Jamursba Medi	278
	No management effectiveness ranking		
	Abun MPA	Kawasan Konservasi Laut Daerah Abun	26,795
	Current management effectiveness ranking: 100 [♦]		
	Sausapor Bay MPA	Cagar Alam Laut Teluk Sausapor	62,660
	No management effectiveness ranking		

[♦]MMAF - E-KKP3K ranking

[†]MEF ranking is based on the management effectiveness tracking tool (METT) developed under the Ministry of Environment and Forestry (15/2015). Results < 33 percent suggest management is ineffective; 33 - 67 percent suggests management is present but not optimally effective; > 67 percent suggests area is sufficiently effective in terms of basic management.

* Located outside the boundaries of FMA 715



SSIC / E CARTER

MARINE & COASTAL MANAGEMENT IN WEST PAPUA



FURTHER INFORMATION

about MPAs: see volume one, chapter four (action framework: establishing marine protected areas)

about MPA effectiveness rankings and the steps required to establish and effectively manage MPAs: see volume two, chapter three



Above: coastal environment in West Papua

West Papua has been proactively advancing sustainable marine and coastal management since the turn of the century. By 2016, the province had already established 13 MPAs, five of which are part of an integrated MPA network (in Raja Ampat) and have already achieved level 3 effectiveness rankings (MPA minimally managed), far in advance of most MPAs in the nation. The province is also host to Indonesia's largest marine national park (Cenderawasih).

Building on these achievements to date, in 2017 the province began the process of marine spatial planning (MSP) for all remaining coastal waters under its jurisdiction (up to 12 nm from the coast) in order to map and categorize permissible (and non-permissible) marine resource use activities.

The process involves a range of governmental and civil society organizations and institutions¹. It aims to incorporate the various traditional tenure arrangements existing across the region (under customary law) and formally recognize them in the spatial plan. This remains challenging due to the lack of existing spatial documentation of *adat* areas, and the MSP process has galvanized a greater awareness in the province of the importance of documenting and recognizing these areas. Such recognition will allow community members with traditional tenure to access their own areas (up to 2 nm from shore) without any form of permit and will require any outsider fishers to gain express permission from the community before utilizing the area(s). In addition to this, the plan will prioritize the general use of coastal waters up to 2 nm from shore for small vessels below 10 GT.

The spatial plan aims to improve the management of at least 7,297,918 ha of West Papua's provincial waters by 2021, with support from the USAID SEA Project.

KEY INDICATORS FOR WEST PAPUA PROVINCE

BASELINE **5 YR TARGET**

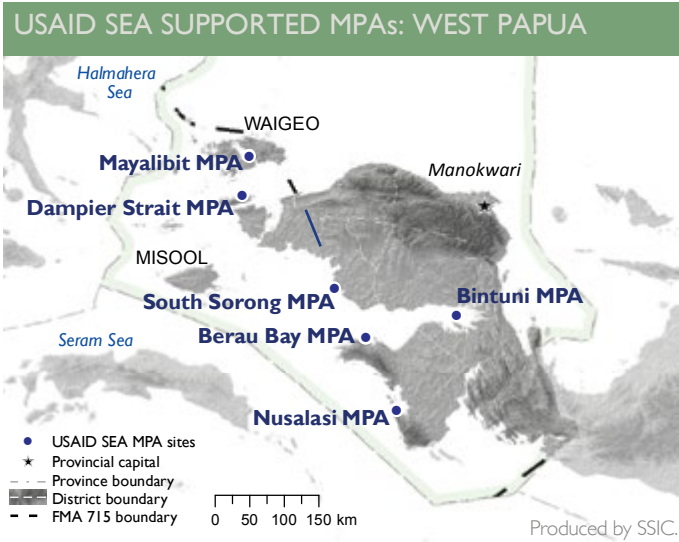
Number of hectares of biological significance and/or natural resources under improved natural resource management as a result of USG assistance, applying MSP .	0 ha	7,297,918 ha
--	------	--------------

These planning efforts have given rise to opportunities to identify areas appropriate for the establishment of new MPAs, and to advance management in existing MPAs. With support from the USAID SEA Project, plans are underway to establish four new MPAs in the region (in Berau Bay, Nusalasi, South Sorong, and Bintuni Bay) and to support traditional fisheries management within two of the existing MPAs in Raja Ampat (Dampier Strait and Mayalibit Bay).

By 2021 , the initiative aims to have achieved improved natural resource management of up to 689,062 ha of biologically significant natural resources in West Papua, with at least 500 ha with no-take zone status and showing improved biophysical condition. Additionally, the project aims to have increased fish biomass by up to 10 percent in selected MPAs.



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KEY INDICATORS FOR WEST PAPUA PROVINCE

	Number of hectares of biological significance under improved natural resource management by applying MPA management as a result of USG assistance		Number of hectares of biological significance and/or natural resources showing improved biophysical conditions as a result of USG assistance		Percent change in biomass of reef fish in selected MPAs	
	BASELINE (ha)	5 YR TARGET (ha)	BASELINE (ha)	5 YR TARGET (ha)	BASELINE (kg/ha)	5 YR TARGET (kg/ha)
Berau Bay (new)	0	99,000	0	At least 9,900	973	+97 (1,070)
Nusalasi (new)	0	251,000	0	At least 25,100	2,174	+217 (2,391)
Teluk Mayalibit	0	53,100	0	At least 15,680	100 (target spp.)	+10 (110)
Dampier Strait	0	~146,800	0	Est. 5,143	50 (target spp.)	+5 (55)
South Sorong (new)	0	Up to 336,288	Not applicable. Mangrove focused MPA.			
Bintuni Bay (new)	0	Up to 203,136	Not applicable. Mangrove focused MPA.			
TOTAL TARGETS *	689,062 ha		At least 500 ha		At least a 10% increase in fish biomass	

* Total targets are lower than the sum total of site targets. Figures reflect the minimum anticipated achievements for the province.

The fishery resources of this province are estimated to provide livelihoods for nearly 15,000 households (BPS Provinsi Papua Barat, 2017). Production from marine fisheries has been estimated at more than 150,000 tons/year; however, as this data has been collated from limited landing site assessments, it is thought to underestimate the overall catch from the area.

Of all fish and marine products harvested in the province, only two percent are processed locally, with the majority of products being utilized for immediate local consumption or traded to other regions. An estimated 41 percent of processed fish are traded frozen (BPS Provinsi Papua Barat, 2017).

Key fishery products include small pelagic species (such as mackerels, scads, and anchovies), demersal fish species (such as grouper and snapper), as well as non-fish products such as crab and shrimp.

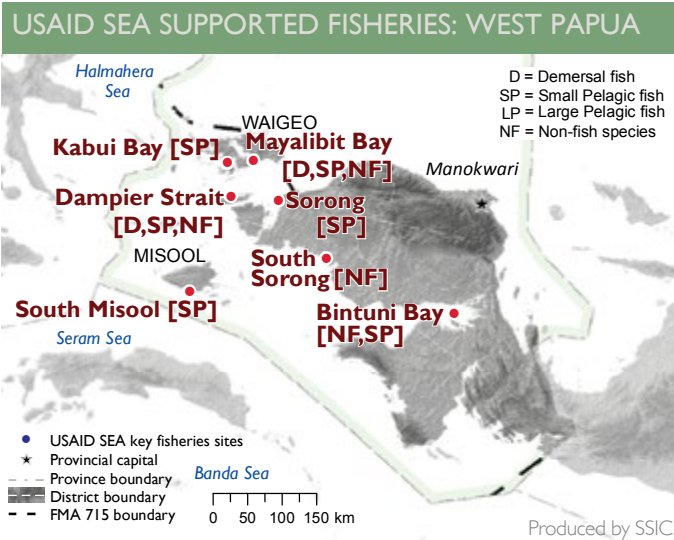
Under the USAID SEA Project, sustainable fisheries management began to be supported in 2016, through the implementation of EAFM targeting seven different fishery regions across the province.

Above, left: liveaboard boat in Raja Ampat

Below: making a crab trap

FURTHER INFORMATION

about EAFM: see volume one, chapter four (action framework: fisheries)



CTC / Y PUTRA



The support provided by the USAID SEA Project aims to improve the natural resource management of 2,189,375 ha of biological significance for fisheries by 2021, with selective areas expected to see up to a 10 percent increase in CPUE. In addition to this, at least 400 small-scale fisher vessels will have been registered through support from the project.

KEY INDICATORS FOR WEST PAPUA PROVINCE	BASELINE	5 YR TARGET
Number of hectares of biological significance and/or natural resources under improved natural resource management as a result of USG assistance, applying EAFM	0 ha	2,189,375 ha
Percent change in catch per unit effort for selected gear and landing sites	Data currently being analyzed (kg / unit of effort)	10% improvement
Number of small vessels registered	0	400

Through the work being implemented in spatial planning, MPA development, and sustainable fisheries management, the USAID SEA Project will be trialing at least three innovations for marine and coastal management. To date, an innovative process for participatory mapping to support the development of the spatial plans has already been implemented, and a number of the fishery support sites are in the process of trialing I-Fish-compatible technology to support the collation and analysis of fishery data.

Overall, these support efforts aim to provide direct increased economic benefits to at least 150 people across the province and ensure a more secure tenure for local custodianship or managed access in coastal waters for more than 650 individuals.

KEY INDICATORS FOR WEST PAPUA PROVINCE	BASELINE	5 YR TARGET
Number of innovations supported with USG assistance	0	3
Number of people with increased economic benefits derived from sustainable natural resource management and conservation as a result of USG assistance	0	150
Number of people with more secure tenure or managed access	0	667

The support efforts underway in the province also aim to result in the appropriate development, adaptation, and/or production of at least four legislative products (laws, policies, strategies, plans, or regulations) to support biodiversity conservation. The first of these is already in development (the RZWP-3-K spatial plan).

KEY INDICATORS FOR WEST PAPUA PROVINCE	BASELINE	5 YR TARGET
Number of laws, policies, strategies, plans, or regulations addressing biodiversity conservation officially proposed or adopted as a result of USG assistance	0	4
Number of people who apply improved conservation law enforcement practices as a result of USG assistance	0	60

Underpinning all of these efforts, the USAID SEA Project will provide necessary training and capacity building to at least 500 key stakeholders in the province, including government officials, fishers, collectors, community representatives, industry representatives, and relevant fisher and community associations.



FURTHER INFORMATION

about I-Fish technology, managed access, vessel registration, CPUE and steps required to achieve EAFM: see volume two, chapter four

about participatory mapping: see volume two, chapter three

about local custodianship of marine and coastal environments: see volume one, chapter four (traditional governance)

about law enforcement: see volume one, chapter four (action framework: enforcing the law)

about existing attitudes and behaviors being targeted across the region: see volume two, chapter five

about stakeholder training and capacity needs being addressed: see volume two, chapter six

In addition to this, awareness and behavior change campaigns will be implemented through select target MPAs and fishery sites in order to promote a greater understanding of the importance of sustainable management and the mechanisms by which it can be achieved as well as to promote the adoption of sustainable practices.

KEY INDICATORS FOR WEST PAPUA PROVINCE

	BASELINE	5 YR TARGET
Number of people trained in sustainable natural resources management and/or biodiversity conservation as a result of USG assistance	0	500
Number of people demonstrating behaviors that contribute to biodiversity conservation, as a result of USG assistance	0	400

The remainder of this chapter explores the key fishery and MPA sites of focus in West Papua province. Through these sections we will learn what makes these areas so important to protect. We discover what has been learned so far about the places and the people, the marine environment and fishery resources, the fishers and other marine resource users of the areas, and we will see what steps are currently underway at each site to achieve sustainable management and to meet all of the above targets for the province.

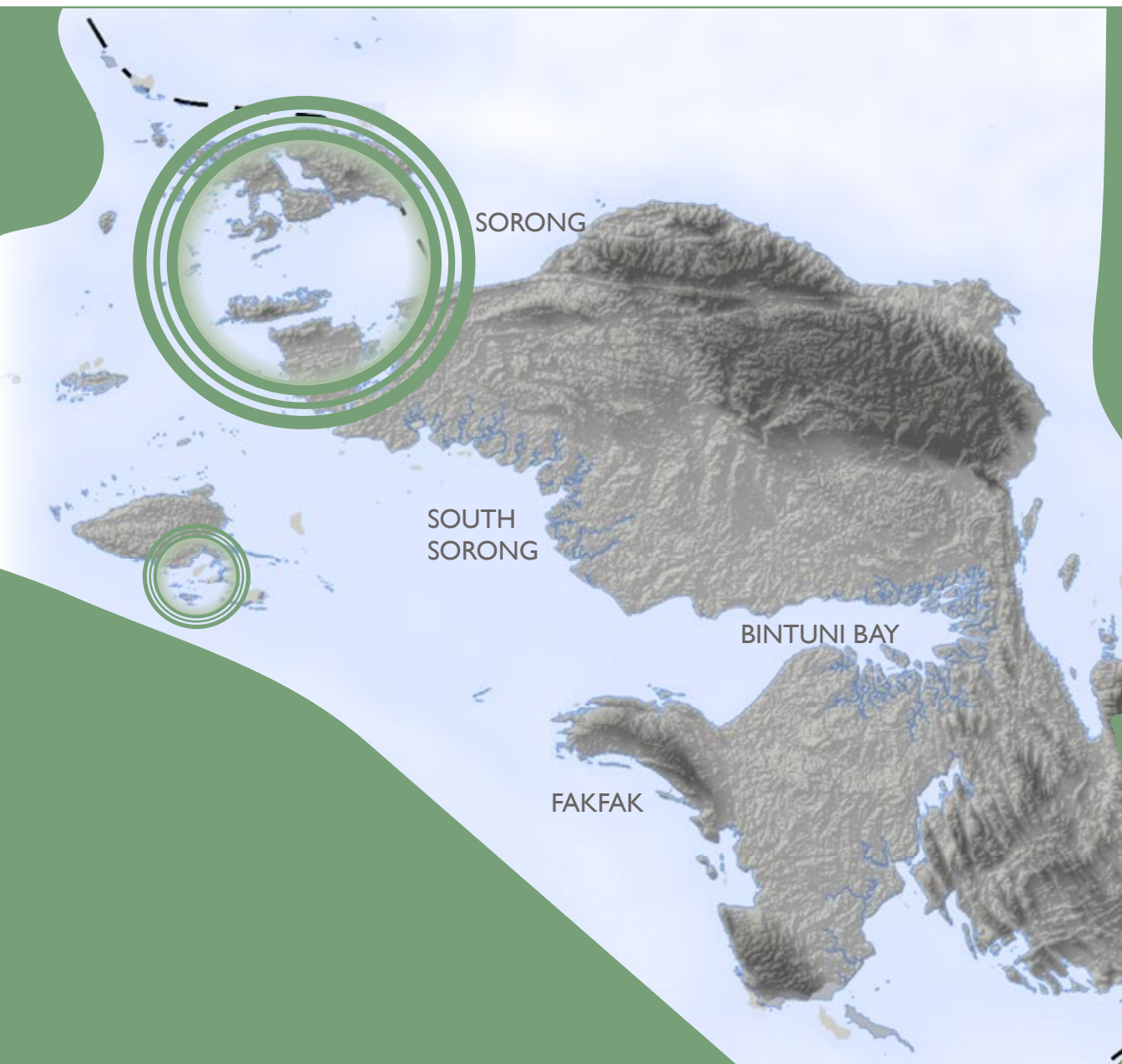
¹ Under the Governor of West Papua, key entities involved in the marine spatial planning process are the following provincial agencies: Marine and Fisheries; Culture and Tourism; Public Works; Transportation; Energy and Mineral Resources; Environment and Land. Additionally, the process is engaging representatives from Development Planning Agency at the sub-national level, the Regional Disaster Management Body; the Natural Resource Conservation Bureau; the Faculty of Fisheries and Marine Science of the University of Papua (UNIPA); the National Land Body Area Office; the Coastal and Marine Resource Management Office of Sorong; the Meteorology, Climatology and Geophysics Body for West Papua; the Cenderawasih Bay National Park Office; the Mitra Bahari Consortium; World Wildlife Fund and Bird's Head Seascape representatives, supported by the regional secretariat.



Right: fishers pulling in a net in West Papua



RAJA AMPAT





DEPOSITPHOTOS.COM

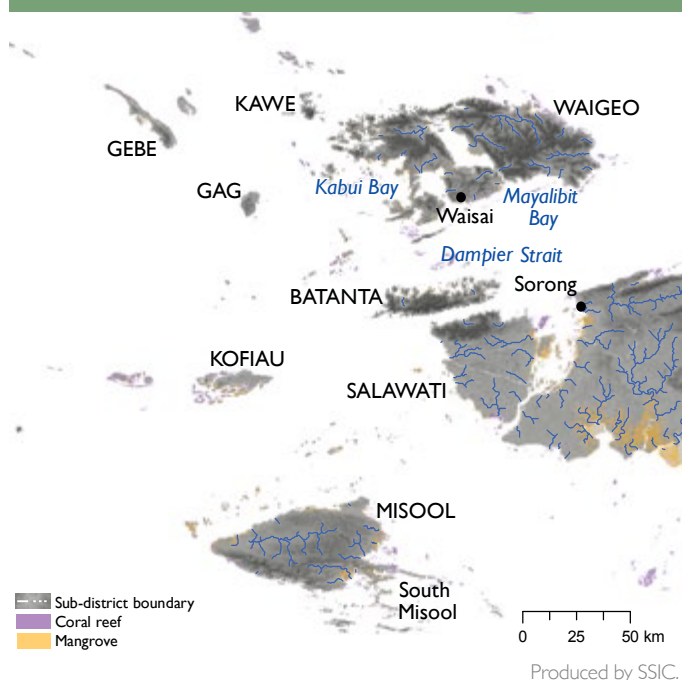
Raja Ampat is often described as the global epicenter for marine biodiversity (Stuart-Smith, 2014). It comprises more than 1,500 small islands; the main land masses are the larger islands of Waigeo, Batanta, Salawati, Misool, and Kofiau. All forms of marine tropical species, small or large, can be found in these waters, from over 700 mollusk species, vibrantly-colored nudibranchs, and tiny pygmy seahorses to giant devil rays, orcas, and blue whales.

The breathtaking biodiversity of this region was first noted in the late 1980s and 1990s, at a time when pressures had just begun to increase in the region through a combination of illegal vessels entering the area to fish, increases in destructive fishing practices, and mining companies becoming active in the area. In the mid-2000s, a consortium of NGOs began working with the government to protect and sustainably manage the region, leading to the establishment of the first fully operational MPA network in Indonesia. This resulted in the reduction of destructive fishing to less than 1 percent of fishers as well as a 90 percent reduction in illegal outsider fishers entering the area (Katz *et al.*, 2015). This effective management in turn saw an average increase in fish biomass of 114 percent and a 12 percent average increase in live coral cover (Katz *et al.*, 2015).

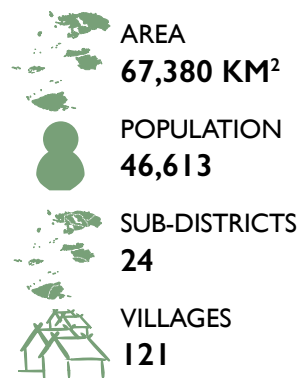
Despite these successes, however, Raja Ampat's future is not yet secure. Faced with changes in governance and management structure frameworks as well as some degree of conflict over tradi-

tional customary marine tenure set amidst an ever-growing demand for marine resources, the region is at a critical juncture to ensure marine biodiversity, local food security, and livelihoods can be sustained.

RAJA AMPAT



Above: colorful reef, Raja Ampat



Source: BPS Kabupaten Raja Ampat, 2017a

THE MAGIC OF MAYALIBIT

Mayalibit Bay (*Teluk Mayalibit*) is a unique inlet bay located at the heart of Waigeo Island, so large that it almost divides the island in two (SRA, 2015). It is only accessible via a narrow fjord-like channel opening into the South Pacific Ocean and provides habitat for a diverse array of marine ecosystems, including coral reefs, mangroves, and seagrass beds (Jakub *et al.*, 2017c).

The bay takes its name from the Maya people who originally settled in the Waigeo area, with 'libit' referring to 'bay' in the local language (SRA, 2015).

The bay is home to a population of approximately 1,990 people (455 households) distributed across 12 villages. Fishing is a primary source of food and livelihoods in all communities, complemented by small-scale household farming (Jakub *et al.*, 2017a). The fishery targets of Mayalibit are many and varied.

Small pelagics such as the narrow-banded Spanish mackerel (*Scomberomorus commerson*), Indian mackerel (*Rastrelliger kanagurta*), and short mackerel (*Rastrelliger brachysoma*) are harvested for both domestic consumption and for sale through Waisai market, with collectors predominantly located in Lopintol village. To catch Indian mackerel, Mayalibit fishers use an unusual technique known as *balobe*, whereby gas lamps are tied to the corners of their boats at night, attracting the mackerel, who are then guided and trapped into small pocket-shaped areas in the limestone coral rocks of the bay. Once trapped, the fishers scoop them out with a fine mesh net.

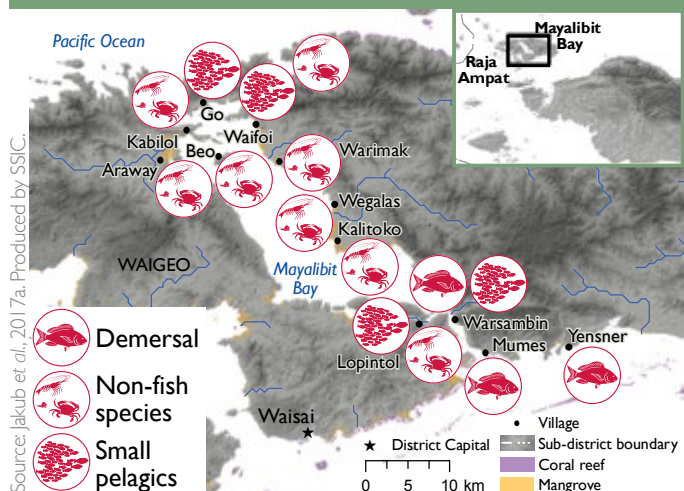
Demersal target species include groupers (particularly *Cromileptes altivelis*, *Epinephelus fuscoguttatus*, *Plectropomus maculatus*, and *Plectropomus areolatus*) and snappers (*Lutjanus bohar*, *Lutjanus argentimaculatus*, and *Lutjanus gibbus*). These are generally caught using hooks and lines or spears and are also traded

Below: The Mayalibit Bay hills



RARE

MAYALIBIT TARGET FISHERIES

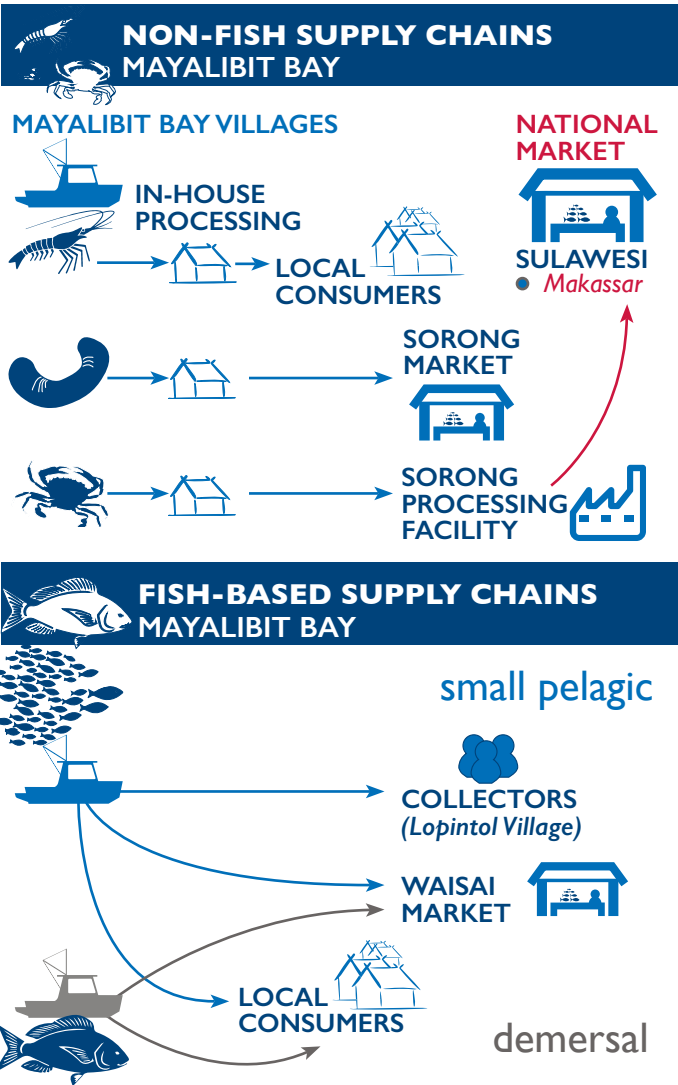


locally or utilized for consumption, with some few fishers keeping grouper cages to grow out fish to sell to the live reef fish trade. In recent years, these demersal species have also been targeted by recreational sport fishers entering the area, often causing consternation for local fishers.

A range of non-fish species are also harvested in the area. Sea cucumbers (*Holothuroidea sp.*) have been caught for many generations using traditional free diving. However, following some recent crocodile attacks on free divers, fishers are turning to mini-trawls for safety. Harvested sea cucumbers are processed (cooked and dried) in the villages and sold directly to Sorong.

Shrimp harvesting (*Acetes sp.*) is predominantly undertaken by the communities' women, with the products being dried and sold locally (in Waisai) or processed into paste and sold directly to Sorong. Finally, blue swimming crabs (*Portunus pelagicus*) are sometimes harvested based on buyer requests. They are boiled locally and transported to Sorong, where they are processed and shipped on to Makassar (Jakub et al., 2017a).

Fishing vessels in Mayalibit are small (up to 9 m) and generally wooden or made of fiberglass. Many are unmotorized, and those that have motors generally have a maximum 25 HP engine (Jakub et al., 2017a).



Source: Jakub et al., 2017a. Produced by SSIC.

SUSTAINABLY MANAGING MAYALIBIT


Like many areas of eastern Indonesia, the indigenous communities of Mayalibit have strong customary links to the ocean, with tenurial claims over traditional fishing grounds. Two key indigenous clans are resident in Mayalibit (the Ambel and Langgayan) and are considered descendants of the original Maya people (*Suku Maya*). Only these indigenous clans (and sub-family groups aligned with these clans) are considered to have rights of ownership and management over the marine areas. Across the villages, the various immigrant families and clans (some of whom have lived in the Bay for more than 20 years) have only utilization rights, but not management or ownership rights. This traditional system is well understood and respected amongst Mayalibit people.


Legal name
Kawasan Konservasi
Perairan Raja Ampat:
Area II, Teluk Mayalibit
Year est. 2007

Decree and status
PerBup no. 66/2007;
PerDa no. 27/2008;
PerBup Raja Ampat no.
5/2009



Management plan? ✓
Zoning plan? ✓
Size 53,100 ha



Area of NTZ coverage
Reserve area = 15,680 ha

Av. hard coral cover ⁽¹⁾
 20%

Av. fish biomass ⁽²⁾
 200
kg/ha

villages in MPA 12

Population ⁽³⁾
 1,990
 455

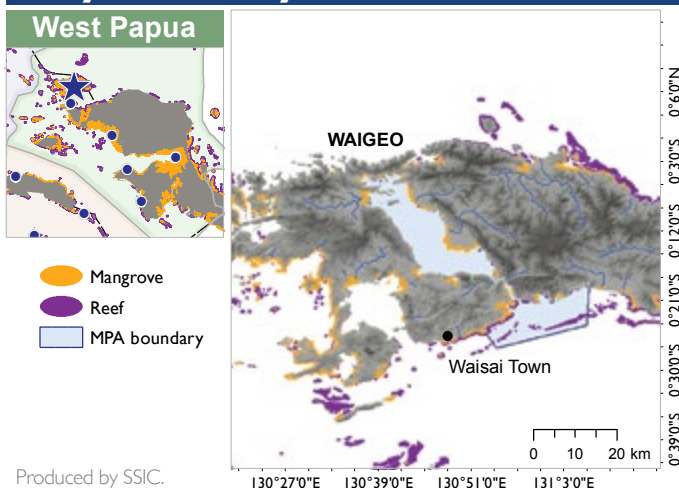
Key protected species
 Sharks
 Indian
mackerel

¹ SE ~3% (Ahmadia et al., 2017).

² Measuring only three families:
Lutjanidae (snappers), *Haemulidae*
(sweetlips) and *Serranidae* (group-
ers) (Ahmadia et al., 2017).

³ Jakub et al., 2017a.

Mayalibit Bay MPA



Current management effectiveness ranking: 300



In 2007, the bay was formally declared an MPA under the Raja Ampat MPA network; in 2009, the area was expanded to cover 53,100 ha (Wilson et al., 2010). Following this, a zoning plan was developed incorporating both biophysical and socioeconomic considerations, in collaboration with the communities in the MPA. This led to delineations for use zones that made efforts to align with customary tenure boundaries rather than solely administrative ones, in order to reinforce traditional tenure rights (Mangubhai et al., 2015). The final management plan for the Raja Ampat MPA network was approved in 2013 under a Raja Ampat regency decree.

However, studies undertaken in 2016 revealed some levels of overlapping territorial rights, with relatively low levels of compliance with the zoning regulations (Irwanto and Inayah, 2017c). In addition to this, with a tourism market emerging in the region and a consequently increasing demand for fishery products, fishers sensed their catches were declining (Rare, 2017), potentially indicating some degree of overfishing was occurring.

DEPOSITPHOTOS.COM



VILLAGE GOVERNANCE: TIGA TUNGKU

Village governance in Teluk Mayalibit is implemented through three key roles in each community, referred to as the *tiga tungku* (which literally translates as ‘three furnaces’). The head of the village (*kepala desa*) is an elected official with political power who can have a strong influence over government, trade, and traditional affairs (particularly if they hail from one of the indigenous clans). The customary (*adat*) leader is the custodian of local wisdom and traditions; their influence can extend into matters of politics and governance through the Raja Ampat Council of the Maya Tribe (linked to district government) and the Papuan People’s Assembly (linked to provincial government). Finally, the church pastor and/or mosque imam maintain religious norms and practice within communities.



Below, left: reef sharks are abundant in Mayalibit Bay

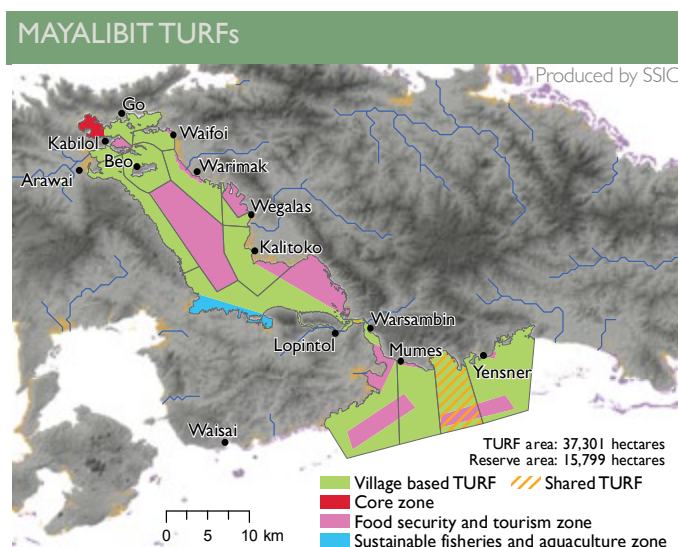
Therefore, in 2016, with support from the USAID SEA Project, work began to further refine and build upon the existing zoning system to implement TURFs adjacent to no-take reserves. This was led by the traditional tripartite leadership existing in each of the 12 villages in the bay, known as *tiga tungku*.

It is through such leadership that Mayalibit Bay became the first formal ‘customary fishery area’ (*kawasan perikanan adat – KPA*) in February 2017, declared through *adat* decree (no. 1/2017), supported by all village heads, *adat* leaders, and religious leaders, and endorsed by the Council of the Maya Tribe.

The refined zoning system of the KPA has identified 12 TURF areas, covering a combined area of 34,722 ha, with a further 15,680 ha set aside as no-take zones (reserves).

Since the KPA’s declaration, each of the TURFs has had associated fishing regulations developed. These vary by area, but broadly include: input controls (related to permissible fishing gears, vessel sizes, and access rights), output controls (related to catch limits and fish size limits), temporal (short term) and periodic (long term) closures of fishing grounds (based on the *sasi* system) (Jakub, 2017d).

In the coming years, further work will be undertaken to support the effective implementation of these TURF + Reserve systems to promote sustainable small-scale fisheries and protect the marine biodiversity and productivity of Mayalibit Bay MPA.



SUMMARY USAID SEA PROJECT SUPPORT

UNDERTAKING FISHERY ASSESSMENTS

Assessing stocks of key fishery species (Indian mackerel, shrimp, groupers, and sea cucumbers) as obliged under the customary fishery area regulations, in order to guide and inform management. Utilizing an I-Fish-compatible software (OurFish) to synchronize data management with the government fishery database.

STOCK
ASSESS

I-FISH

IMPLEMENTING FISHERY INTERVENTIONS

Promoting compliance with the 12 TURF + Reserves established at the site and their associated harvest-control rules. Advancing market access and value-add opportunities through improved post-harvesting processes (particularly for shrimp in Arway and Beo communities).

INPUT &
OUTPUT
CONTROL

MARKETS

TURFS

MONITORING, EVALUATION & MANAGEMENT

Trialing small-scale fisher logbooks and monitoring activities, promoting local vessel registration, and the adoption of fisher ID cards.

LOG
BOOKS

VESSEL
REG

FISHER
CARDS

for a full description of these activities: see volume two, chapter four

Studies reveal there is a strong sense from communities that they proactively comply with rules and regulations that protect their fish from depletion. However, when this is explored further, it is apparent that awareness and understanding of the relatively recently established KPA and associated TURF regulations are limited, and real awareness of the impact human activities can have on the abundance of fish resources is wavering. While this is perhaps to be expected given the newness of the systems, it highlights the importance of future outreach, awareness raising, and behavior change efforts (Kushardanto *et al.*, 2018).

Commitment to comply with fishery rules and regulations



Awareness of TURF's fishing regulations



Awareness of TURF



Awareness of relationship between human activities and fish abundance



Key behavior changes anticipated:

- Increased appreciation of the connectivity between human actions and fishery sustainability
- Increased understanding of the KPA and associated TURF regulations
- Willingness to comply with TURF + Reserve regulations
- Willingness to monitor fisheries through logbooks, and acquire vessel registration and fisher ID cards

Target audiences: Fishers, leaders (village, religious, and adat), fish collectors

Key capacity-building support areas provided:

- Sustainable fisheries co-management for TURF + Reserves
- Logbook usage, monitoring techniques, and SIMKADA
- Improved post-harvest management (particularly for women enterprise groups)
- Effective traditional governance

Target audiences: Fishers, leaders (village, religious, and adat), fish collectors

THE DENIZENS OF DAMPIER

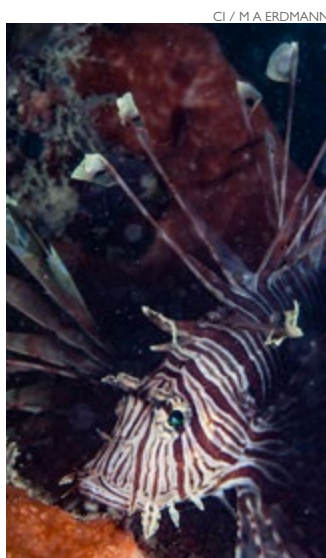
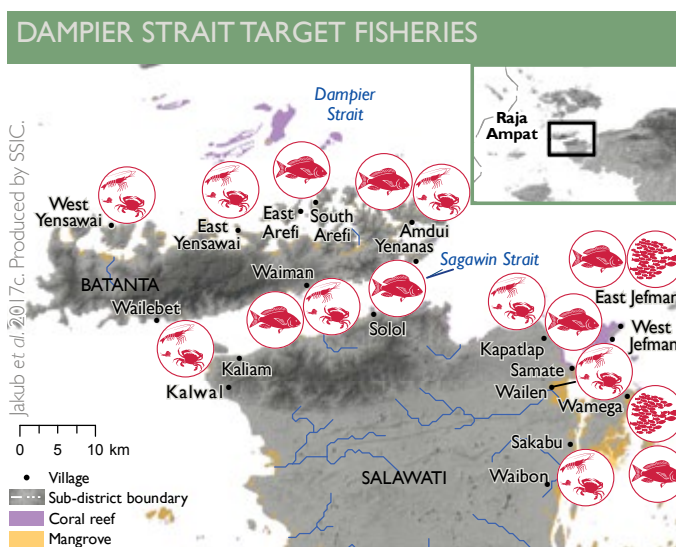
Dampier Strait is a large passage of water that runs between Waigeo Island in the north and Salawati Island in the south. Named after the British explorer William Dampier (1651–1715) the area is famed for its strong currents and vibrant marine life.

The nutrient-rich waters that surge through this channel are driven by the Indonesian Throughflow and support a marine biota that has been described as ‘staggering’ (Silcock, 2016), with coral-encrusted seamounts creating a profusion of color and the waters buzzing with tropical fish (Wuest, 2018). So rich is the region that it was Dampier Strait that first attracted intrepid scuba diving enthusiasts to Raja Ampat more than 20 years ago (Silcock, 2016).

To the south of the Dampier Strait, the island of Batanta is flanked either side by these powerful waters and separated from the larger island of Sulawati by the narrow Sagawin Strait. Along the coastlines of these islands are five sub-districts (North Salawati, Central Salawati, West Salawati, South Batanta, and North Batanta). Within these sub-districts are 19 key coastal villages.

These villages vary in size from Weiman village (with a population of just 110 people / 29 households) to Amdui village (665 people / 129 households). Overall, 6,003 people live in the coastal region in 1,352 households (Kushardanto *et al.*, 2017a and 2017b).

Below: Dampier Strait marine life





RARE

In each of these communities, fish and marine products are a primary source of nutrition, and there is a high dependency on fishery resources. Agriculture in these communities is limited, with some villages having no viable land for farming (Jakub *et al.*, 2017b).

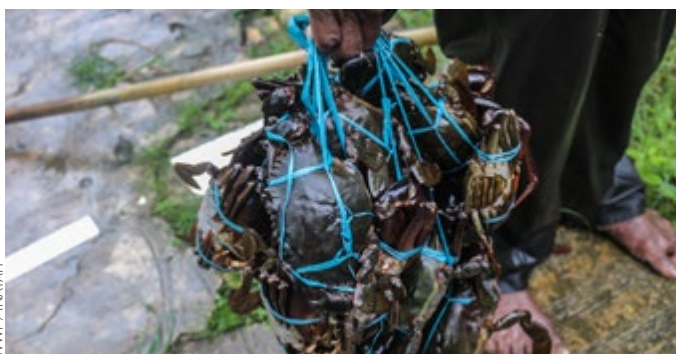
Target fishery species are many and varied. They include pelagic species such as anchovies (*Engraulidae*) and trevally (*Carangidae*) as well as demersal species, predominantly snapper (*Lutjanidae*), grouper (*Serranidae*), and rabbitfish (*Siganidae*).

In addition to this, non-fish species are heavily targeted in the region, including lobsters (*Nephropidae*), sea cucumbers (*Holothuroidea*), mud crabs (*Portunidae*), the blue swimming crab (*Portunus pelagicus*), and top shells (*Trochus niloticus*).

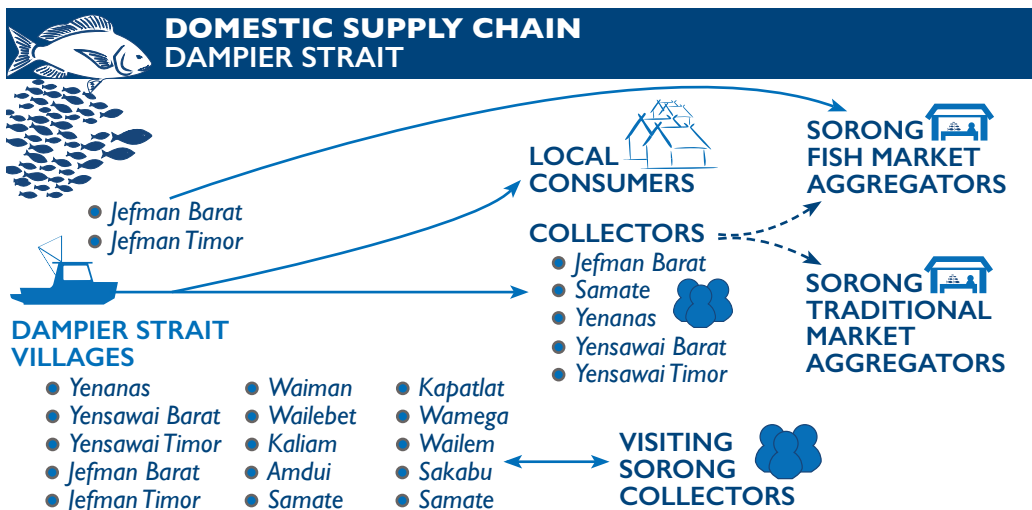
The most commonly used fishing methods include hand line fishing for demersal fish, trolling for small pelagic fish, and spearfishing. Three forms of traditional gleaning activities are also undertaken in the region (Kushardanto *et al.*, 2017a; Nita, 2016):

- *Bameti* gleaning is carried out on the intertidal plains at low tide, targeting mostly crustaceans.
- *Molo* is a form of free-diving to collect benthic species such as sea cucumbers. *Molo* gleaners often wear home-crafted diving masks made from wood frames and glass taken from the ends of bottles.
- *Kalawai* lobe gleaning is conducted at night by using gas lamps above the water and spearing target prey with a form of spear (*kalawai*). This gleaning generally targets fish, lobsters, and octopus.

Where fishers go out to sea, the vessels are generally small, home-made craft. Many are non-motorized, and where motors are used, they are generally up to 15 HP *ketinting* motors (Jakub *et al.*, 2017c).



WWF / INAYAH



Source: Jakub *et al.*, 2017b; Kushardanto *et al.*, 2017a. Produced by SSC.

Most of the fishery catches in the area are utilized for subsistence or local sale (between individuals). Sales are undertaken immediately following landings of catch, as cold storage options are almost non-existent across in the region (with electricity supplied only at night to 90 percent of the villages) (Kushardanto *et al.*, 2017b).

Fish collectors operate in at least five of the communities. These collectors bring ice from Sorong and buy up catches over a period of two to four days (depending on the quality of the ice) before taking their goods to sell in Sorong. Fishers in villages near to Sorong may also sometimes take their fish directly to the town for sale (Jakub *et al.*, 2017b; Kushardanto *et al.*, 2017a).

Sales are generally made to aggregators and other collectors at Jembatan Puri fish market and Boswesen traditional market in Sorong. However, trade through these collectors is relatively small scale, as the local traders are restricted by the quantity they can carry, usually limited to two collection boxes, each containing approximately 400 kg. In addition to this, the local traders often lack the capital required to purchase the fish and will often only pay the fishers once they have returned from selling them on in Sorong.

Finally, very rarely Sorong buyers will proactively visit the Dampier region with ice and empty cool boxes to make direct purchases from the fishers (Jakub *et al.*, 2017b; Kushardanto *et al.*, 2017a).

Like Mayalibit, the communities of Dampier have existing marine tenurial arrangements based on clan traditions and rights of ownership. In Kapatlap village, a *sasi* has been established where catching lobster is prohibited. In Samate village, a sea cucumber *sasi* is operational. In Weiman village, outsider fishers are prohibited from fishing in village waters, but are permitted to anchor and purchase fishery products. In Kaliyam village, outsider fishers are permitted to use the villages waters for subsistence fishing, but not for extracting catch for trade.

However, despite these customary arrangements, the region is experiencing increasing pressure from outsider fishers and occasional inter-village disputes over use areas and arrangements. Implementing a clear TURF system combined with no-take reserves would create clarity over use areas and permissible actions while respecting the traditional cultural frameworks of the region.



Above, left: small fishing vessel in
Sagawin Strait

Left: mud crabs

Legal name
Kawasan Konservasi
Perairan Raja Ampat:
Area III, Selat Dampier

Year est. 2007

Decree and status
PerBup no. 66/2007;
PerDa no. 27/2008;
PerBup Raja Ampat no.
5/2009

Management plan? ✓

Zoning plan? ✓

Size 336,000 ha

Av. hard coral cover⁽¹⁾  29%

Av. fish biomass⁽²⁾  50 kg/ha

SEA FOCUS AREA

Area of SEA project focus
~146,800

Area of existing NTZ coverage⁽³⁾ 5,143 ha

villages in area 19

Population⁽⁴⁾

 6,003

 352

Key protected species

 Manta rays

 Dolphins

 Dugongs

 Whales

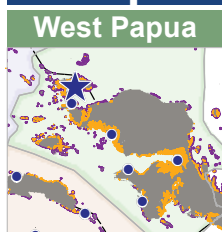
¹ SE ~3% (Ahmadia et al., 2017)





² Measuring only three families: *Lutjanidae* (snappers), *Haemulidae* (sweetlips) and *Serranidae* (groupers) (Ahmadia et al., 2017).

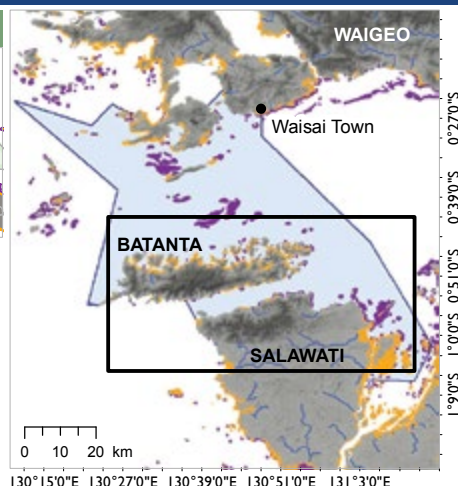
³ This includes 2,826 ha of NTZs protected under official MPA core zone designation, plus 2,317 ha protected under adat declaration.

⁴ Jakub et al., 2017c.

Dampier Strait MPA



 Mangrove
 Reef
 MPA boundary
 USAID SEA Project focus area



Produced by SSIC.

Current management effectiveness ranking: 300



A TIME FOR TURFS

A large part of the Dampier Strait (including not only Sulawati and Batanta Islands, but stretching far beyond to Gam and Waigeo) was first designated to be an MPA in 2007 as part of the Raja Ampat MPA network, resulting in an MPA covering a total area of 336,000 ha. Since that time, marine and coastal management in the region has progressed considerably, and a zoning plan approved in 2013 set aside large no-take zones and sustainable use areas throughout the park.

As part of the plan, the coastal regions of the 19 villages between Sulawati and Batanta were designated 'traditional use zones'. However, beyond that broad classification, no further steps were taken to specify use for these areas. Therefore, in 2017, with support from the USAID SEA Project, work began on identifying and designating these traditional use areas to establish a series of TURF + Reserves for the communities in the region.



Given the complex claims on customary marine ownership in the region, work to date has also been exploring potential opportunities to conjoin traditional waters in some areas, with the aim to sustainably manage larger sites at the same time as promoting collaborative rela-

tions between communities. To this end, several potential sites have been identified for further exploration and development in the coming years. This includes areas where villages adjacent to one another may combine their marine claims to establish large TURFs together, as well as areas where family connections between villages are strong and may lead to agreements combining marine territories for mutually beneficial marine management purposes.

SUMMARY USAID SEA PROJECT SUPPORT

UNDERTAKING FISHERY ASSESSMENTS

Assessing stocks of key fishery species in order to guide and inform management. Utilizing an I-Fish-compatible software (OurFish) to synchronize data management with the government fishery database.

IMPLEMENTING FISHERY INTERVENTIONS

Promoting the development of effectively managed TURF + Reserves under the umbrella declaration of a customary fishery area (KPA) and motivating compliance with the associated harvest-control rules developed. Exploring opportunities to leverage improved market access for fishers.

MONITORING, EVALUATION & MANAGEMENT

Trialing small-scale fisher logbooks and monitoring activities, promoting local vessel registration, and the adoption of fisher ID cards.

● **for a full description of these activities: see volume two, chapter four**

In order to promote and establish TURF + Reserves in Dampier, it will be important to ensure communities have a strong understanding of the benefits and importance of managing marine and coastal resources sustainably. Also, the concepts and constructs of TURF + Reserves will need to be fully understood and embraced, an endeavor that may be supported by learning from the neighboring area of Mayalibit Bay, which has already established TURF + Reserves within its KPA. However, at the time of writing, KPA development is very new in Mayalibit, therefore considerable socialization will be required to generate awareness amongst Dampier fishers of this learning opportunity nearby (Kushardanto et al., 2018).

Awareness of (neighboring) KPA



Awareness of relationship between human activities and fish abundance



Key behavior changes anticipated:

- Increased appreciation of the connectivity between human actions and fishery sustainability
- Understanding of TURF + Reserves, KPA establishment, and associated TURF regulation development
- Willingness to comply with TURF + Reserve regulations
- Willingness to monitor fisheries through logbooks, and acquire vessel registration and fisher ID cards

Target audiences: Fishers, leaders (village, religious, and adat), fish collectors

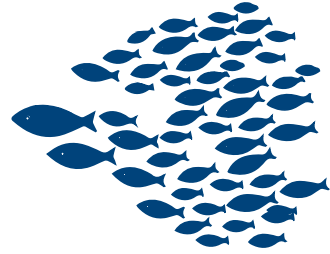
Key capacity-building support areas provided:

- Sustainable fisheries co-management for TURF + Reserves
- Logbook usage, monitoring techniques, and SIMKADA
- Improved post-harvest management and market access
- Effective traditional governance

Target audiences: Fishers, leaders (village, religious, and adat), fish collectors

● Left: Dugong are protected in the Dampier Strait MPA

THE ANCHOVIES OF RAJA AMPAT



Anchovies play an important role in the commercial fisheries and the economies of communities in Raja Ampat. However, in the last two decades, pressures on this fishery have been steadily increasing, reaching a level that threatens the future sustainability of this resource.

Key common species of anchovies fished in the region include Devis' anchovy (*Encrasicholina devisi*), buccaneer anchovy (*Encrasicholina punctifer*), shorthead anchovy (*Encrasicholina heteroloba*), and spotty-face anchovy (*Stolephorus waitei*) (Mandagi, 2017).

The fishery generally utilizes lift nets (and some small purse seines) during night fishing. Light is shone in the water to attract the anchovies to the surface, over submerged nets, where they are then caught.

From 1999 to 2005, the number of anchovy fishers in Raja Ampat increased rapidly, with one region – Kabui Bay – seeing an increase from only 20 fishers to 250 fishers in that period (Bailey *et al.*, 2008; Mandagi, 2017c). By 2005, the economic value of the lift net fishery in Kabui Bay was estimated at USD 2.1 million/year, with lift net owners earning up to USD 10,870/year and individual fishers earning as much as USD 1,835/year, nearly double the average fisher income in the area at that time (Bailey *et al.*, 2008).

Since 2005, the market demand for anchovies has continued to steadily increase, both domestically and internationally, both for human consumption and as live bait for the tuna industry. This has led to migrant anchovy fishers being attracted to Raja Ampat (particularly from Sulawesi), which has increased local fishing pressure. To date, no formal regulation on the anchovy fishery exists, therefore the only existing input control is on the registration of lift net devices, and this currently has no clear limits defined.

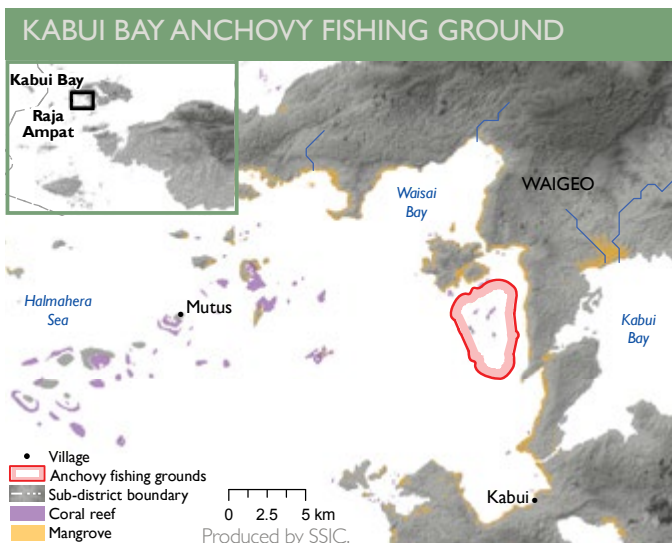
According to local fishers, this high level of unregulated harvesting is leading to declining stocks and decreasing catch yields. If left unchecked, this may lead to a reduction in income-earning opportunities for local communities as well as reduced availability of important food fish for nutritional health, and of bait stock for the important pole and line fishery regionally. In addition to this, declining anchovy stocks threaten to impact ecological integrity in the region, as anchovies are important forage food for many top predator species, such as sharks and tuna (Huffard *et al.*, 2012; PPUKP, 2017).

However, hard data is limited (almost non-existent) in this fishery, and there is an urgent need to establish monitoring and data collection activities in order to better understand the level of threat this fishery faces and implement appropriate management mechanisms to promote sustainability.

In 2017, the USAID SEA Project began supporting work in two key anchovy production areas in Raja Ampat, Kabui Bay and South Misool, to support the design and development of an EAFM approach for sustainable fisheries management, enhance food security, and conserve marine biodiversity.



●
Right: anchovies



KABUI BAY is part of the Dampier area of Raja Ampat. It is host to a total of 31 villages. The two communities of focus for this initiative are Mutus and Kabui villages, which are stakeholders in an anchovy fishing ground covering around 17,000 ha.

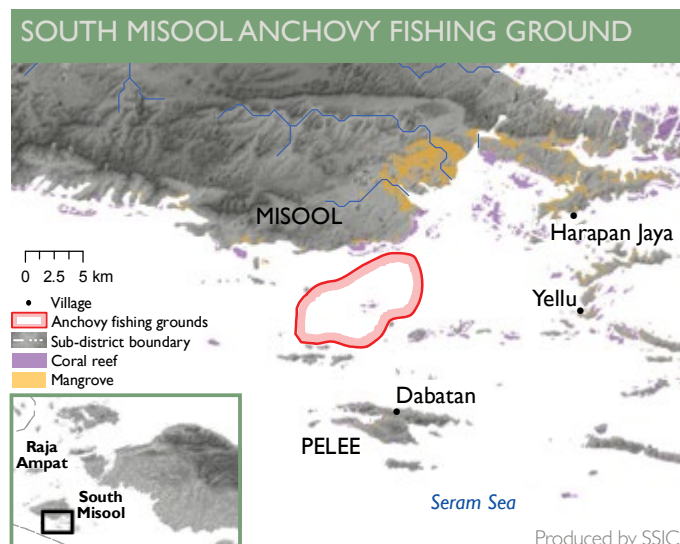
In this area, anchovy fishing is undertaken predominantly by migrant Buginese fishers (from South Sulawesi) and Sorong-based fishers of Chinese descent. The villagers themselves are not directly fishing anchovies. However, they have

traditional custodianship over these waters (being predominantly of Maya ethnicity) and have come to a long-standing agreement with the anchovy fishers, who pay a fee of roughly 3 million IDR/month to both communities to have the right to fish in their waters (Mandagi, 2017b).

Assessments undertaken by the USAID SEA Project in 2017 observed eight lift net operations active in this area, with some large lift net vessels also active outside of these traditional waters (using nets up to 40 m²). The number of fishers working on any one lift net ranges from 10 to 15 people depending on net size and weather conditions, with Kabui Bay often experiencing strong northerly winds.

SOUTH MISOOL is located further south and has a total of 21 villages. In this area, work is focused on three villages, Yellu, Harapan Jaya, and Dabatan, which are stakeholders in an anchovy fishing ground covering around 22,000 ha.

Here, like in Kabui, the villages have traditional custodianship over these waters, being of *Matbath* ethnicity, and charge a monthly fee for the predominantly migrant fishers to have access to the area. The traditional head of the communities (*petuanan*) has the locally-recognized authority to give anchovy fishing permits to outsiders. Unlike Kabui, however, in South Misool, some of the community members play an active role in the anchovy fishery, as fishers, collectors, or traders.



Studies have shown there are at least ten large lift nets in operation in these waters, each with a production capacity of 10 tons of wet anchovy per lift. Some smaller operators are also present, with vessels manned by three to four fishers and using lift nets with a capacity of around 200 kg per lift. Fishing is undertaken all year round, though from September to October each year operations are often hampered by strong southerly winds. In addition to the common anchovy

species fished in this area, the Hardenberg's anchovy (*Stolephorus insularis*) is also harvested (Mandagi, 2017b).

Catch rates across both fisheries vary greatly depending on the lunar cycle. The most productive time is during new moon, while closer to full moon catch rates diminish considerably, often with no catch at all on the full moon.

The catches are generally sold by 'wet weight' (i.e. freshly caught anchovies, usually sold as bait fish) or 'dried weight' (i.e. dried out and sold for consumption or future processing). At landing sites, small 5-kg containers are used to measure the weight and assess catch and payments (Mandagi, 2017b).

In Kabui Bay, fishers tend to sell directly to markets, whereas in South Misool there are 38 local collectors from the communities (Yellu – 30, Dabatan – 6, and Harapan Jaya – 2). There are also two major collectors from South Sulawesi operating in Yellu village (Mandagi, 2017b). Of all the community members engaged in the anchovy fisheries across these two sites, approximately 20 percent are women (Mandagi, 2017d).

Preliminary studies of the supply chain have revealed that dried anchovies can sell for markedly different amounts depending on the location. For wet anchovies, collectors have been found to sell on the fish at a price eight times greater (on average) than the price they paid to the fishers (Mandagi, 2017d).

In the coming years, the USAID SEA Project will be supporting further research in the area to ascertain stock status and identify appropriate harvest management strategies in collaboration with the local communities. The implementation of more formally recognized TURFs will also be promoted to maximize benefit streaming for local communities, and market-based value-add opportunities will be sought to optimize fisher incomes and promote compliance with sustainable management practices.

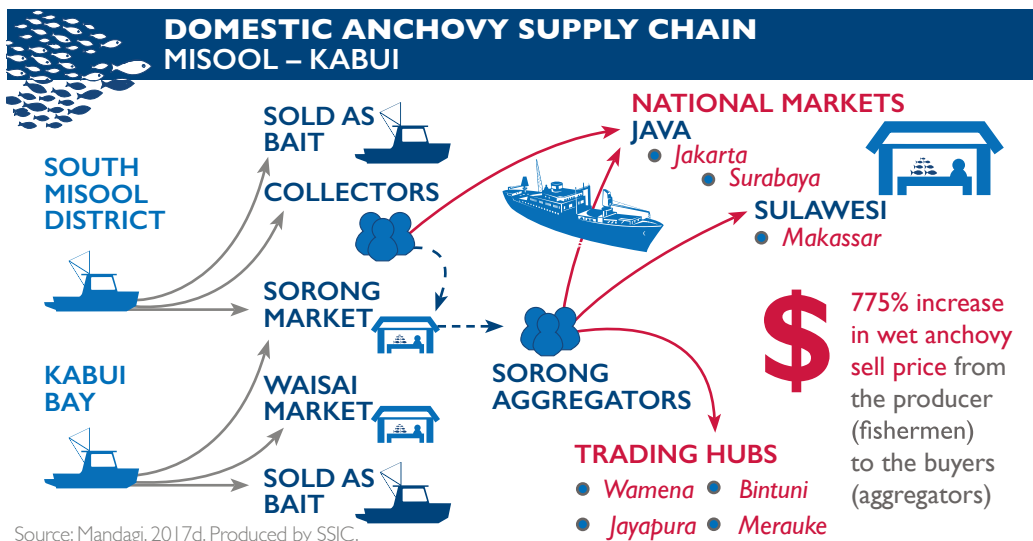
THE COMMUNITIES OF KABUI AND MISOOL

Overall, the five villages of focus have a combined population of 1,140 people, living in relatively basic conditions with limited services available. Electricity is only available at night (6 pm to 5 am), provided by village-based diesel generators, and, with no piped water supplies available, communities are reliant on shared wells or rainwater catchment for water.

The communities are relatively isolated, both geographically and socially. For example, while cellphone ownership is common, less than 20 percent of community members own smartphones that have wider access capabilities, and while television ownership is high, only approximately 18 percent of villagers have access to cable TV, satellite dishes, or DVD players (n = 108) (Mandagi, 2017b).

Other household assets, such as saving accounts, are sparse across the region, though they have a greater presence in Yellu and Dabatan (suggesting relatively greater levels of income may be available in these areas). Notably, however, more than 50 percent of community members own social security health insurance (*Badan Penyelenggara Jaminan Sosial – BPJS*) following a government drive for this in recent years.

Mandatory elementary schools are available locally; however, less than 50 percent of school-aged children can be found attending them across these communities, and livelihood options remain heavily focused on fishing and farming. Most fishers also appear to undertake small-scale farming to some extent, with land areas under ownership ranging from 2 to 20 ha. Key crops in the region are bananas, coconut, and cassava (Mandagi, 2017b).



SUMMARY USAID SEA PROJECT SUPPORT

UNDERTAKING FISHERY ASSESSMENTS

Examining anchovy fishery harvests, catch trends, and associated socioeconomic conditions. Making recommendations for harvest strategies and supporting implementation. Improving the fishery database management system for the West Papua government and the MMAF.

IMPLEMENTING FISHERY INTERVENTIONS

Exploring value-add opportunities through supply chain and market assessments. Implementing TURFS recognizing marine tenure rights. Supporting managed access to maximize benefit streaming for local communities. Developing input and output controls as part of the harvest strategy (to be endorsed through local policy).

MONITORING, EVALUATION & MANAGEMENT

Establishing monitoring systems, promoting licensing system for lift net vessels and SIMKADA registration for fishers.

STOCK
ASSESS

I-FISH

INPUT &
OUTPUT
CONTROL

MARKETS

TURFS

LOG
BOOKS

VESSEL
REG

FISHER
CARDS

Key behavior changes anticipated:

- Increased recognition and appreciation of marine tenure rights
- Willingness to comply with TURF access restrictions
- Willingness to comply with harvest rules

Target audiences: Local fishers, industry, government

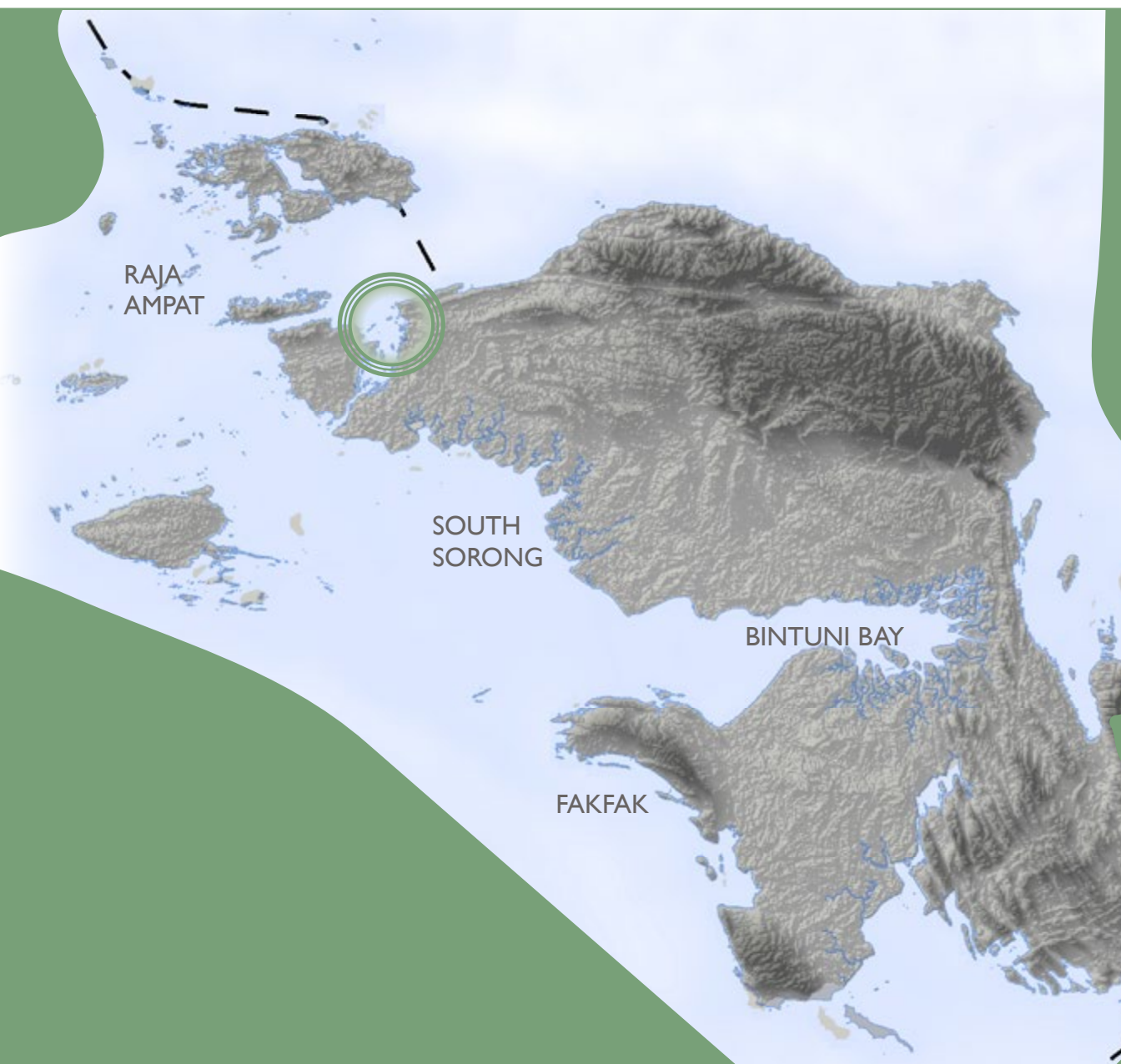
Key capacity-building support areas provided:

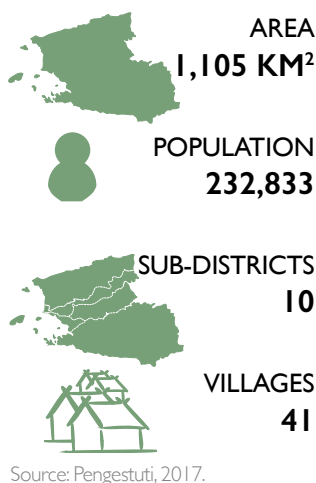
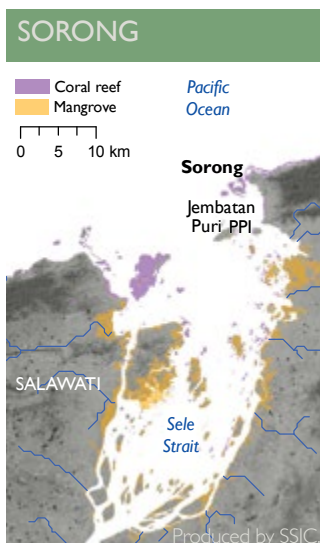
- Sustainable fisheries management
- Database development and management
- Monitoring methodologies and implementation
- Harvest control design and implementation
- Design, development, and implementation of TURFs

Target audiences: Local fishers, industry, government

for a full description
of these activities: see
volume two, chapter four

SORONG



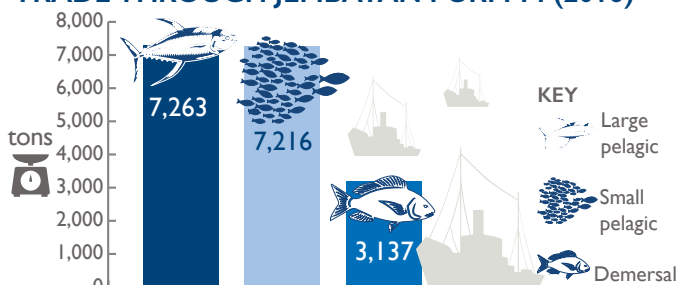


The main port and fish market of Sorong city is Jembatan Puri PPI. Fishery products from throughout West Papua (including Raja Ampat, South Sorong, and Bintuni) are traded through this port, with an active market operational daily from 4.30 am to 8.30 am.

In 2016, more than 17,000 tons of pelagic and demersal fish were traded through this center (Pangestuti, 2017). Small pelagic species are generally traded for local consumption, with some vessels traveling to Surabaya in Java for sales (Mandagi, 2017a). Large pelagic, demersal, and non-fish species are often traded on to wider markets and export companies. The port is also the major processing and export center for the region, with more than 591 tons of fish canned for shipping and 766 tons of shrimp processed and frozen for transit (Pangestuti, 2017).

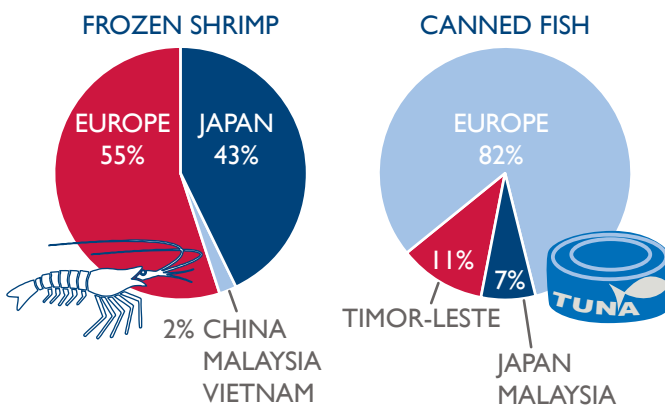
Collection vessels from across the region dock at Jembatan Puri PPI. Studies conducted in 2017 and 2018 through support from the USAID SEA Project revealed that approximately 80 percent of the vessels are collector ships and transit fleets (Inayah, 2018).

TRADE THROUGH JEMBATAN PURI PPI (2016)



Source: Pangestuti, 2017. Produced by SSIC.

KEY DESTINATIONS FOR PRODUCTS TRADED THROUGH JEMBATAN PURI PPI (2016)



Source: Pangestuti, 2017. Produced by SSIC.



RARE

These vessels are all greater than 20 GT and able to carry up to 10 tons of fish on average. The key common species they were found to be transporting were Indian mackerel (*Rastrelliger kanagurta*) and redtail scad (*Decapterus kurroides*) (Inayah, 2018).

Fishing vessels active in the waters around Sorong also bring their catches directly to the market; common species caught locally include frigate tuna (*Auxis thazard*), redtail scad (*Decapterus kurroides*), buccaneer anchovy (*Encrasicholina punctifer*), Indian mackerel (*Rastrelliger kanagurta*), and the narrow-barred Spanish mackerel (*Scomberomorus commerson*) (Inayah, 2018).

Therefore, this port is a major trading hub for fisheries, vital for the economy of the region and bustling each day with intense bartering that involves fishers and traders from the whole province. Unfortunately, however, there are challenges that threaten the sustainability of these activities.

The port generates an enormous amount of waste, including discarded fish parts (gills, stomachs, scales, and fins) and liquid waste resulting from fish processing. As these bioproducts degrade, they pose considerable hygiene risks, potentially leading to contamination of the products being traded and shipped. Additionally, packaging, plastics, and general garbage compound this waste problem, and much of it ends up as ocean pollutants. Informally-employed cleaners, who used to care for the area, can no longer operate since the release of a presidential regulation in 2016 forbidding individuals to levy service fees outside of formal contractual arrangements (PerPres no. 87/2016) (Inayah, 2017). Therefore, efforts are required to establish a formal management system for the area that ensures hygiene, health, and safety, not only for the fishers and traders operating in the port, but also for resource users locally and wider consumers nationally and internationally.

Fishing vessels docking at the port have also been found to be transiting ETP species, particularly sharks and rays, suggesting greater awareness is needed regarding the protected status of these species as well as greater vigilance and enforcement to block their trade within the market (Inayah, 2018). In addition to this, evidence of home-made bombs for blast fishing has been found, suggesting destructive fishing practices are taking place locally that urgently need to be addressed.



[Previous page: Jembatan Puri fish market](#)

[Above: bundles of fish for sale at Jembatan Puri fish market](#)

[Right: waste pollution on shore in port](#)

SUMMARY USAID SEA PROJECT SUPPORT

UNDERTAKING FISHERY ASSESSMENTS

STOCK
ASSESS

I-FISH

Undertaking port-based observations and assessments, particularly for small pelagic species. Utilizing an I-Fish-compatible software to synchronize data management with the government fishery database.

IMPLEMENTING FISHERY INTERVENTIONS

MARKETS

Contributing to the development of a fisheries management plan using EAFM (based on the EAFM indicators provided by the MMAF).

MONITORING, EVALUATION & MANAGEMENT

LOG
BOOKS

VESSEL
REG

Trialing small-scale fisher logbooks, promoting vessel registration (SIMKADA), and the establishment of a community surveillance group (*pokmaswas*) on the ground.

Key behavior changes anticipated:

- Greater awareness of ETP species protection and associated regulations
- Awareness and willingness to stop destructive practices
- Willingness to comply with fishery regulations, complete logbooks, and register vessels
- Willingness to engage / participate in community surveillance

Target audiences: Collectors, traders, shipping companies, exporters, fishers

Key capacity-building support areas provided:

- Sustainable fisheries management
- Hygiene and site-trade management
- ETP protection
- Logbook usage and vessel registration

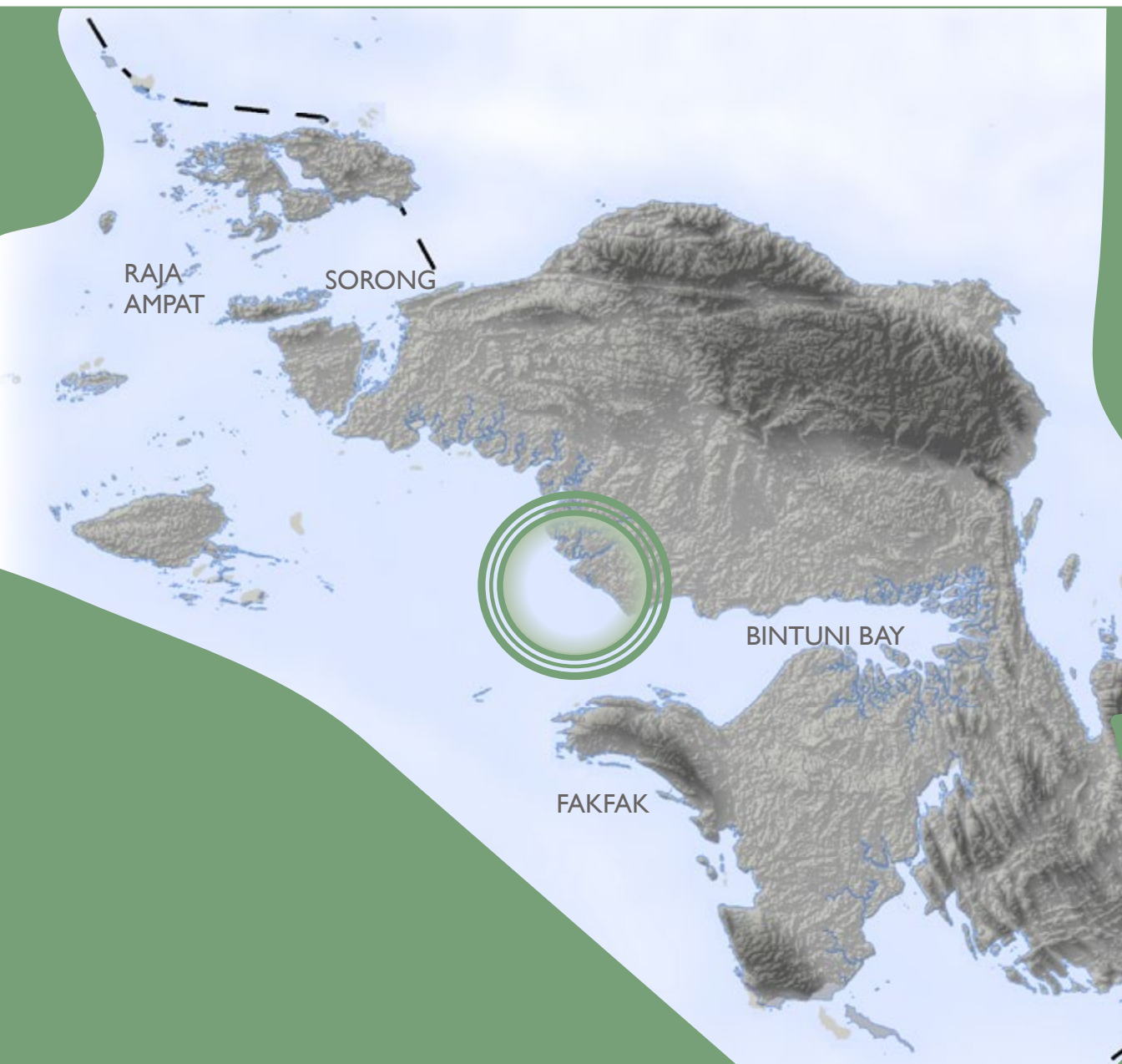
Target audiences: Collectors, traders, shipping companies, exporters, fishers

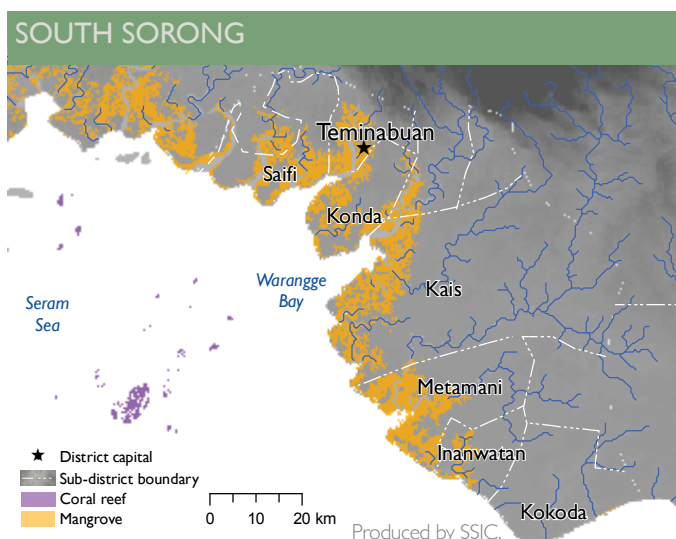
for a full description of the activities being implemented under each of these steps: see volume two, chapter four



WWF

SOUTH SORONG





AREA
8,424 KM²

POPULATION
43,896

SUB-DISTRICTS
15

VILLAGES
123

Source: BPS Kabupaten Sorong Selatan, 2017



South Sorong is located on the west coast of the West Papuan mainland. The land is heavily forested, with powerful rivers and tributaries traversing the landscape. The regency is divided into 15 sub-districts, seven of which are situated along the coast (BPS Kabupaten Sorong Selatan, 2017).

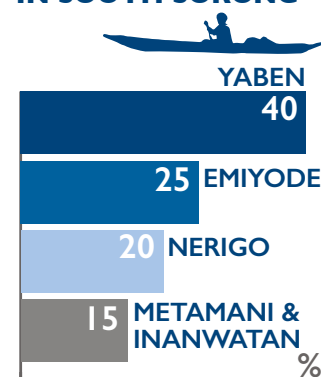
The coastal people of this region are highly dependent upon marine and coastal resources, with fishing and the harvesting of marine products being the primary livelihood of all coastal communities (Irwanto, 2017b). Key fishery targets are shrimps and crabs (for both local consumption and trade), gastropods and various fish species (for subsistence and local sale) (Inayah et al., 2017).

This regency is remote, with limited infrastructure. Many communities are isolated and accessible only from the sea. An estimated 18 percent of the population has no access to electricity, relying instead on flashlights, candles, and oil lamps for lighting, and without the ability to utilize any electrical appliances (Irwanto, 2017b). More than 20 percent of the regency's population lives below the official poverty line of 255,000 IDR/month (approximately 18 USD/month) (Katadata, 2016a; Katadata, 2016b).

Communities throughout the region have strong customary allegiances and clan-based ties based on tribal descent. In Saifi sub-district, communities are of Yaben tribal descent, with many descendants of this tribe also residing in the neighboring Konda sub-district alongside communities comprised of people of Nagna and Apsia descent. In Kais sub-district, the Nerigo tribe is dominant, while in Kokoda the majority of residents are of Emiyode tribal descent (Irwanto, 2017c).

These lineages play an important role in marine resource management throughout the regency, with each tribal grouping and associated clan having designated marine areas under their custodianship (*hak ulayat adat*). Fishers who are members of the custodian clan have access and user-rights, while fishers from other lineages need to receive express oral permission from the relevant clan or *adat* leader (and must sign written agreements in cases of prolonged activities in the clan's waters). This permission is generally given free of charge to fishers who are indigenous Papuans from neighboring clans. However, non-indigenous fishers seeking to access a

TRIBAL MARINE TENURE OVER COASTAL WATERS IN SOUTH SORONG



Source: Irwanto et al., 2017c.
 Produced by SSIC.

clan's waters must pay a fee, which can be up to 1,500,000 IDR (more than 100 USD) for one month of access.

The abundant fishery resources of South Sorong are largely due to the extensive mangrove forests that line the coast, covering a total area of 76,171 ha (Mahendra *et al.*, 2017). Considered to be largely primary habitat (96 percent), these mangroves are dominated by *Rhizophora apiculata*, with other common species found including *Bruguiera gymnorhiza*, *Rhizophora mucronata*, and *Bruguiera sexangular*. In total, 33 different species of mangrove and mangrove-associated species have been identified in the region¹ (Mahendra *et al.*, 2017).

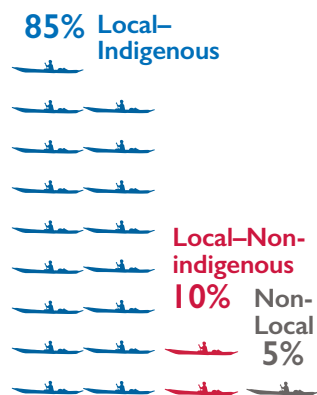
Mangrove tree structure is dominated by mid-sized trees (20–50 cm diameter), and more than half of the sub-districts in the region have mangrove stands that follow classical zoning patterns (Giesen *et al.*, 199; Mahendra *et al.*, 2017).

These mangroves support coastal livelihoods and provide habitat for a range of wildlife, from small annelid worms, crustaceans, and gastropods to tree kangaroos (*Dendrolagus sp.*) (Irwanto, 2017c; Mahendra *et al.*, 2017). Twenty-seven bird species have been identified in these forests, including the white stork (*Ciconia ciconia*), the greater bird-of-paradise (*Paradisaea apoda*), and the little kingfisher (*Alcedo pusilla*). The endangered and endemic maleo bird (*Macrocephalon maleo*) can be found in Saifi District (Mahendra *et al.*, 2017).

A range of reptile species also inhabit the region, including the fourth-largest monitor lizard in the world (*Varanus giganteus*) and the mighty saltwater crocodile (*Crocodylus porosus*) (Mahendra *et al.*, 2017).

Shrimps and crabs, found in abundance in the region, are the main source of subsistence and livelihood in the area, and it is their exploitation that, if not managed sustainability, may threaten both the food security of the local population and the ecological integrity of the region.

ETHNICITY OF SOUTH SORONG FISHERS



Source: Irwanto *et al.*, 2017c.
Produced by SSIC.

Below: mangrove

Below, right: shrimp fishing vessels

Below, far right: shrimp catch in South Sorong



WWF / R PURNAMA

CLASSIC MANGROVE STAND FORMATION IN BINTUNI BAY

The mangrove forests in the sub-districts of Saifi, Kokoda, Inawatan and Konda follow this classic mangrove zonation pattern. Other sub-districts are more varied in zonation.



LANDWARD ZONE
Nypa sp.

MID-ZONE
Rhizophora sp.

SEAWARD ZONE
Avicennia sp.
Sonneratia sp.

Sources: Giesen *et al.*, 1991; Mahendra *et al.*, 2017. Produced by SSIC.

THE SHRIMP OF SOUTH SORONG

Shrimp are by far the most common single marine product to be harvested in South Sorong, and levels of extraction have increased rapidly in recent years. Since 2006, there has been an estimated 73 percent increase in shrimp harvested from the region, with yields reaching approximately 6,653 tons per year by 2016 (DKP Provinsi Papua Barat, 2016). Target species are the banana shrimp (*Penaeus merguensis*), giant tiger prawn (*Penaeus monodon*), and endeavour shrimp (*Metapenaeus ensis*). Peak season for catch is between March and May each year, with a second peak period in August (Inayah et al., 2017).

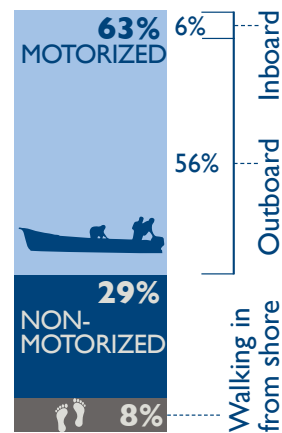
The vast majority of fishers (85 percent) are indigenous to the area, traditionally using rods to catch shrimp. But in recent years there has been a steadily increasing presence of Sulawesi fishers (*Bugis*) migrating to the area, who use trammel nets. This has led to many local fishers readily adopting this tool for fishing; the increase in the number of fishers in the region, combined with the adoption of these more advanced fishing techniques, explains the rapid increase in shrimp yields observed (Inayah et al., 2017). Local government aid has also been provided to local shrimp fishers in the form of boats, engines, and fishing gears, to enable the indigenous population to effectively compete against the outside fishers entering the area, further increasing the exploitation of this fishery (Inayah et al., 2017).

The use of trammel nets has also resulted in far greater yields of secondary target species and bycatch, particularly Indian mackerel (*Rastrelliger kanagurta*) and barramundi (*Lates calcarifer*). Requiem sharks (*Carcharhinus sp.*) are also often caught (Inayah et al., 2017).

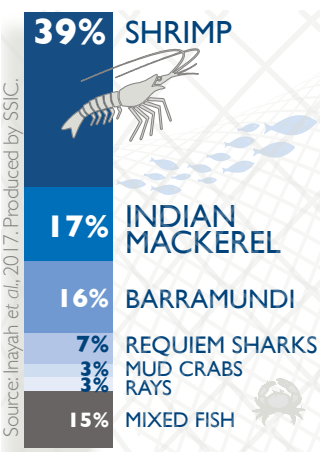
Shrimp catches are landed at village beaches and small jetties throughout the regency, where local collectors are waiting to purchase them. Land-based infrastructure to support fisheries management is almost entirely absent, therefore sales need to be made swiftly to avoid spoilage (Inayah et al., 2017; Irwanto, 2017b).

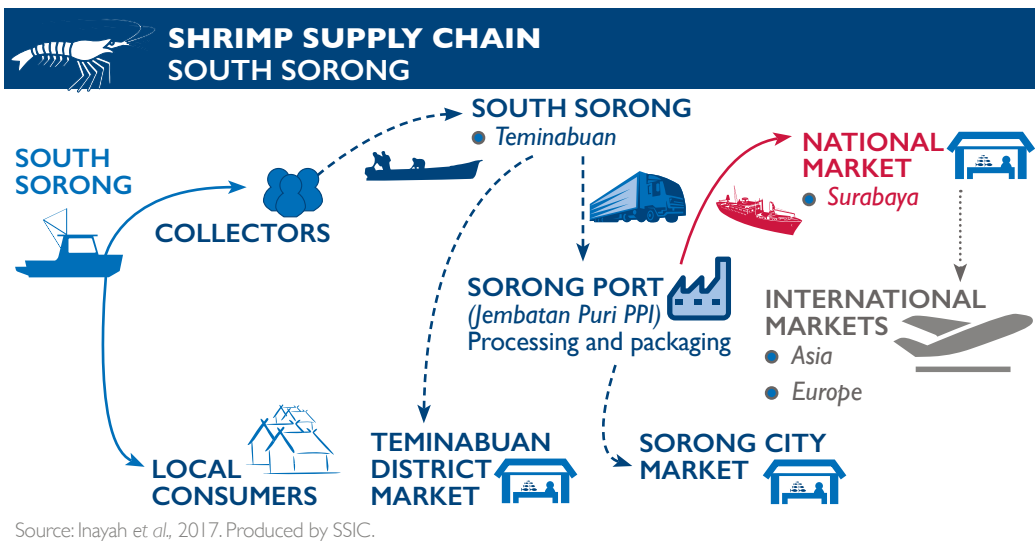


SOUTH SORONG FISHING FLEET



CATCH COMPOSITION FROM TRAMMEL NETS IN SOUTH SORONG



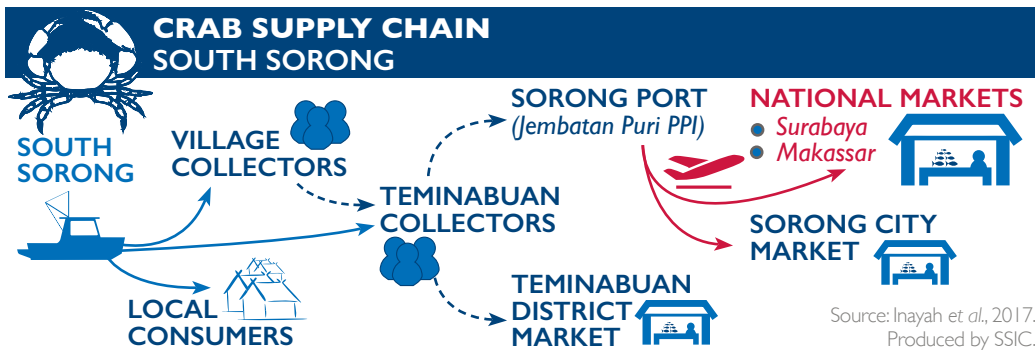


Prices paid by the collectors vary widely depending on the remoteness of the sites (as higher costs are incurred by collectors transporting shrimp from more remote areas). Fishers in remote locations can expect to receive less than half of the price per kilogram earned by their counterparts located nearer to key transit hubs (Inayah et al., 2017).

Today, approximately 86 percent of all local collectors and middlemen working in fisheries in South Sorong work solely with shrimp (Inayah et al., 2017). The vast majority of these collectors are non-indigenous, being predominantly migrants from Makassar, Java, and Sulawesi (Irwanto, 2017b). In many communities, these collectors have formed an alliance with financiers to support groups of shrimp fishers (usually between 9 and 15 fishers per group) to provide loans for the purchase of fuel, gears, and equipment. This supports the fishers' operational costs but can also lead to a trap of indebtedness. Loan repayments are deducted from the catch prices paid by the collectors, meaning that fishers are trapped in a borrower-lender relationship with specific collectors and cannot seek out more competitive selling opportunities until they repay their loan (Irwanto, 2017c; Nurbandika, 2017).

Shrimp that are collected throughout South Sorong are usually transported by sea to Teminabuan (the capital of the regency). From here, some are sold at the town market for local consumption, but the majority are transported overland to Jembatan Puri PPI (the main fishing port) in Sorong city, where they are processed, packed, shipped to Surabaya, and ultimately exported to Asia and Europe (Inayah et al., 2017).

Mud crabs are another key fishery target, particularly the orange mud crab (*Scylla olivacea*) and purple mud crab (*Scylla tranquebarica*). These are generally harvested using traps (*bubu*) and sold





WWF / INAYAH

to collectors based in the capital (Teminabuan). For some fishers, this results in crabs being stock-piled for up to seven days until the load is sufficient to warrant a trip to Teminabuan for sale. For others, village collectors work to gather crabs from the fishers and dispatch them to town. Approximately 14 percent of collectors in South Sorong work with mud crabs, and the price they pay the fisher is dependent on the size (weight) of each crab. Fishers earn an average 70 percent more for each crab over 5 ounces in weight (~142 grams) compared to crabs that weigh less than 2 ounces (~57 grams) (Inayah et al., 2017b).

In Teminabuan, the crabs are further sorted, with low-quality crabs being sold in the local market, while high-quality crabs are transported to Jembatan Puri PPI in Sorong. Here they are sold in the large Sorong market or flown to Makassar or Surabaya (Inayah et al., 2017b).

Mangrove tree wood is also an important commodity in the region, with approximately 30 percent of coastal residents harvesting mangroves for use in home construction (Irwanto, 2017c). In some areas of Kais, Metamani, and Kokoda, mangroves have been felled to make way for palm plantations, and in Saifi and Kais mangrove areas have already been allocated for oil and gas exploration. Seismic surveying to identify future potential oil and gas blocks is ongoing throughout the region, particularly in Kodoka at this time (Irwanto, 2017c).

Such levels of exploitation are already putting strains on the system. The loss of customary marine areas to oil and gas mining in Kais has led to conflicts between neighboring clans, as one clan's waters are encroached on by fishers from other clans seeking subsistence. Tensions are exacerbated by migrant fishers entering the area, often failing to seek appropriate permissions to fish customary waters (Irwanto, 2017c). Some fishers have taken to using destructive poison fishing practices using the mashed-up roots of the native *Derris elliptica* plant (locally known as *akar bore* or *tuba*), further putting pressure on the mangrove ecosystems (Inayah et al., 2017b). In addition to this, the shrimp fishery is beginning to show signs of reproductive overfishing (removal of stock before individuals are able to reproduce), with approximately 37 percent of catches comprised of juveniles who have not yet reached gonad (reproductive) maturity (Inayah et al., 2017b).

Therefore, efforts are urgently needed to establish sustainable marine and coastal management systems in the region. In 2016, discussions commenced to establish an MPA in South Sorong, aiming to encompass the majority of the critical coastal habitat, with clearly defined utilization areas and associated coastal management regulations.



Above: fishers casting nets in mangroves in Teminabuan, South Sorong

New MPA

Working name
SOUTH SORONG MPA

Proposed size up to
336,288 ha

Total mangrove coverage ⁽¹⁾
76,171 ha

Av. mangrove density ⁽²⁾
534 ind/ha

sub-districts **7**

villages **11**

Key protected species

Sharks **Rays**

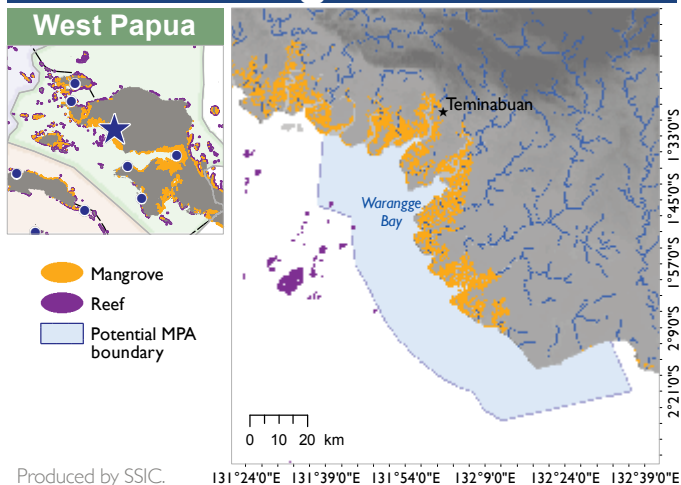
¹ Mahendra et al., 2017

² Data extrapolated from 18 observation sites across 7 sub-districts (Mahendra et al., 2017).



Below: South Sorong mangroves

South Sorong MPA



Current management effectiveness ranking: 0



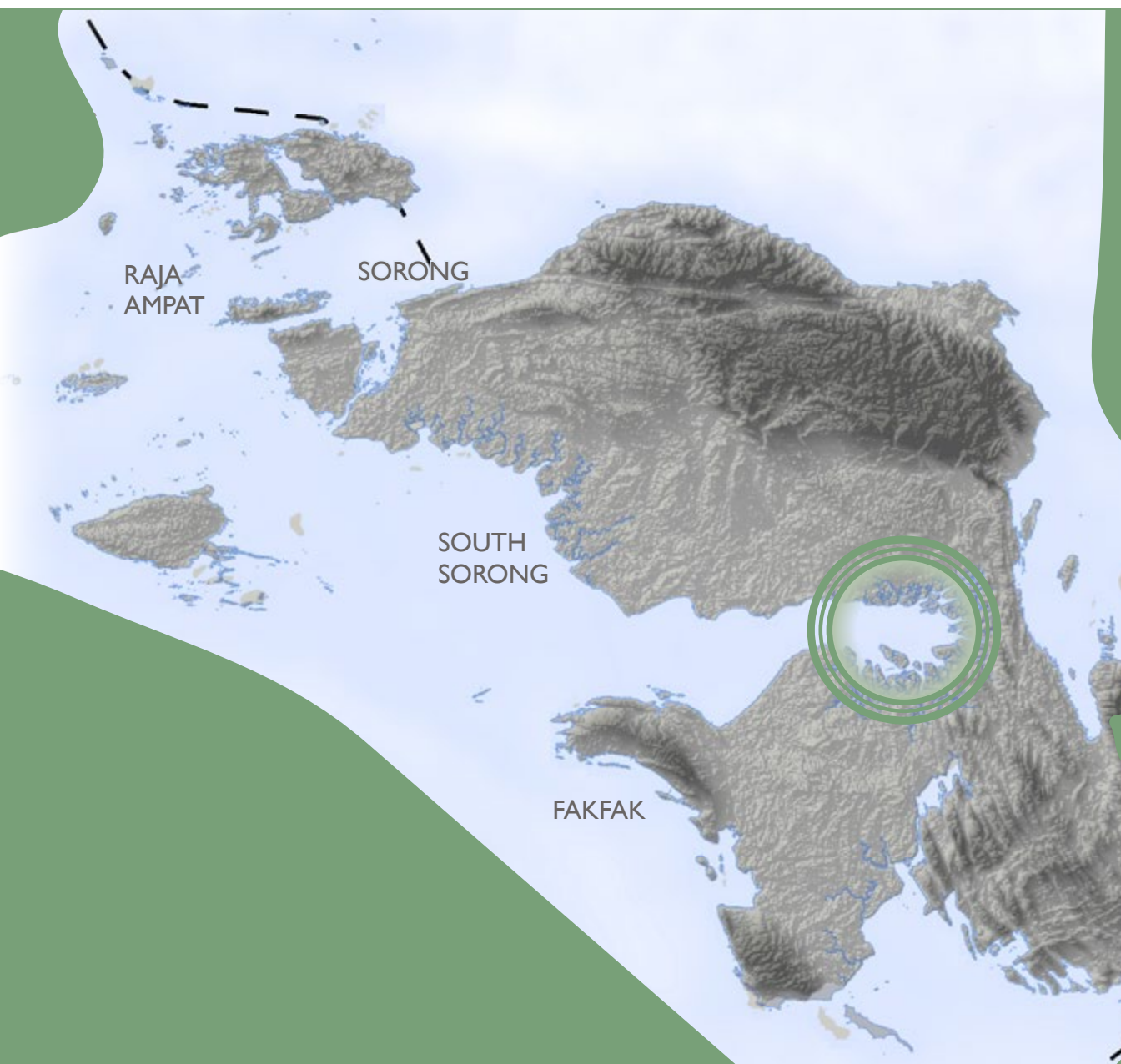
The South Sorong MPA will be designed to accommodate and reflect customary marine tenure arrangements (*hak ulayat adat*). It will serve as an important mechanism through which to develop and promote sustainable fisheries and coastal management regulations. The MPA will also aim to advance inter-clan cooperation through collaborative MPA management.

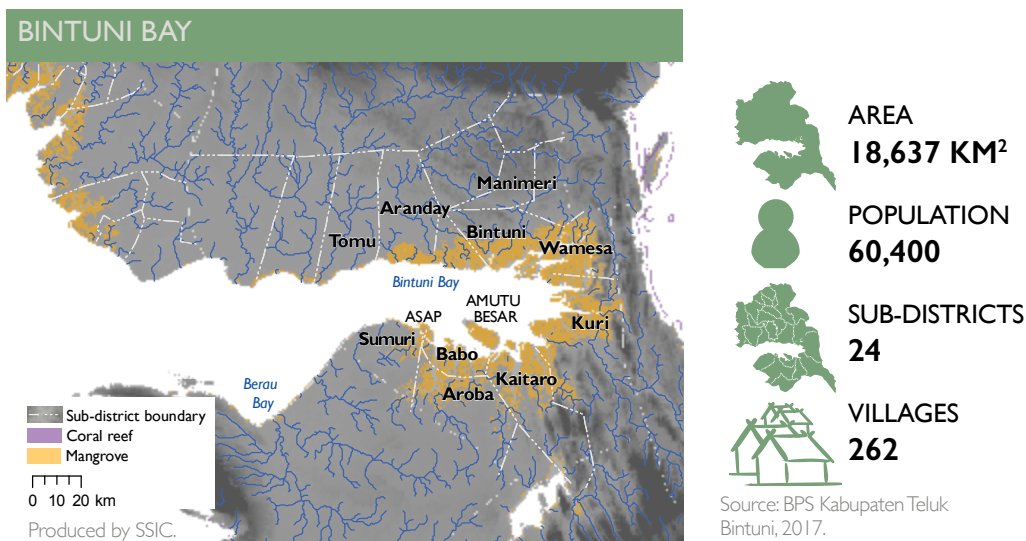
WWF / E B MASRAN



¹ Mangroves and mangrove-associated species in South Sorong: *Acanthus ilicifolius*, *Acrostichum speciosum*, *Aegiceras floridum*, *Avicennia eucalyptifolia*, *Avicennia lanata*, *Avicennia marina*, *Bruguiera gymnorhiza*, *Bruguiera parviflora*, *Bruguiera exaristata*, *Bruguiera hainessii*, *Bruguiera sexangula*, *Calophyllum inophyllum*, *Ceriops decandra*, *Ceriops tagal*, *Excoecaria agallocha*, *Heritiera littoralis*, *Lumnitzera littorea*, *Myristica fragrans*, *Nypa fruticans*, *Pandanus odorifer*, *Milletia pinnata*, *Rhizophora apiculata*, *Rhizophora mucronata*, *Rhizophora stylosa*, *Senna siamea*, *Sonneratia alba*, *Sonneratia caseolaris*, *Terminalia catappa*, *Thespesia populnea*, *Xylocarpus granatum*, *Xylocarpus mekongensis*, *Xylocarpus moluccensis*, and *Pandanaceae* sp (unidentified).

BINTUNI BAY





This regency is located in the center of West Papua. Comprised of highland mountains and lowland coastal plains, furrowed by five large rivers and numerous tributaries, the regency is divided into 24 sub-districts. Ten of these are located around the vast inlet of Bintuni Bay (BPS Kabupaten Teluk Bintuni, 2017).

The perimeter of the bay is dominated by mangroves, covering an estimated area of 260,000 ha and contributing 10 percent of Indonesia's mangrove forests (Wibowo and Suyatno, 1998). Based on surveys conducted in 2017 through support from the USAID SEA Project, a total of 21 true mangrove species¹ and five mangrove-associated species² have been identified in the bay, with the *Rhizophora* family most commonly occurring (Masran *et al.*, 2017).

More than half of the mangrove stands in the bay (52 percent) are categorized as medium-density stands and 11 percent are categorized as high density³ (Masran *et al.*, 2017). These mangroves support an enormous range of biota. Snails, bivalves, and a wide range of invertebrate species can be found, including 53 species of mollusk (Petocz, 1983) and 15 families of crustaceans (Iskandar, 2010). There are 46 documented families of fish inhabiting the bay (Simanjuntak *et al.*, 2011) as well as ETP species, including turtles, sharks, dolphins, and rays. Saltwater crocodiles can also often be found lurking amongst the mangroves (Inayah and Darmono, 2017; Masran *et al.*, 2017).



The habitat supports a large shrimp population as well as an extensive and diverse crab population, from scampering fiddler crabs (*Uca sp.*) to lumbering mud crabs (*Scylla sp.*). These shrimps and mud crabs are the primary targets for fishers, providing livelihoods for more than 1,200 households around the bay (BPS Kabupaten Teluk Bintuni, 2017; Inayah and Darmono, 2017; Masran *et al.*, 2017).

WWF / IRWANTO

Left: mangroves, West Papua

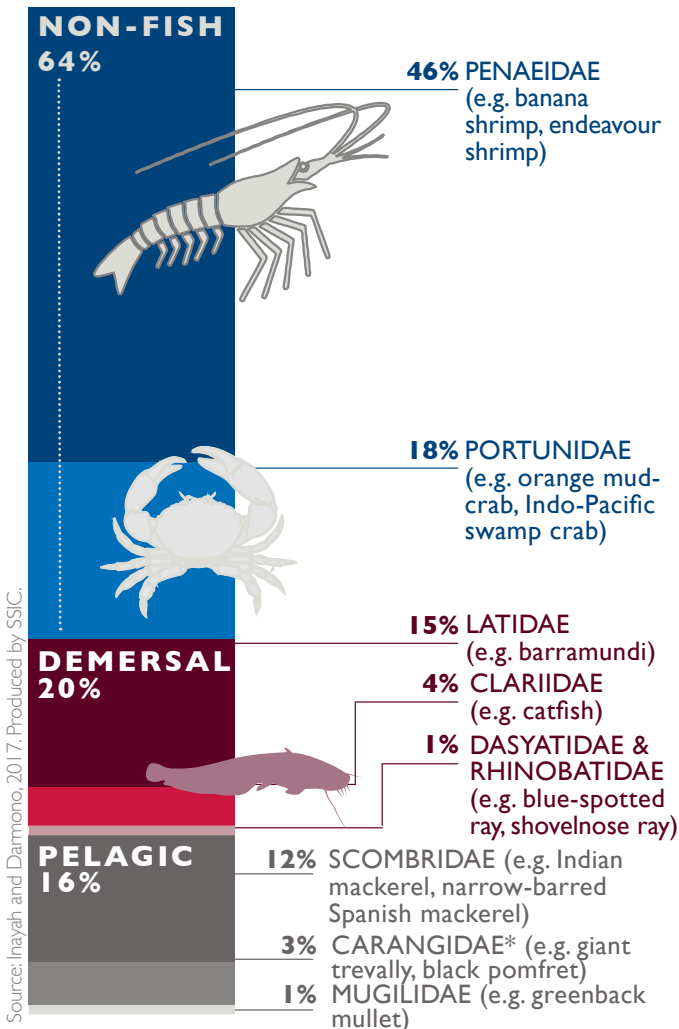
From the 1970s until the early 2000s, the bay was extensively fished by industrial shrimp trawling vessels. The companies operating these vessels participated in fishermen transmigration programs, bringing their workers into the area. This industrial harvesting of shrimp was stopped following the issuance of a MMAF ministerial decree in 2014 (no. 56/2014) that imposed a moratorium on trawling vessels (Daniel *et al.*, 2017; Irwanto *et al.*, 2017). Workers who lost their jobs through this moratorium as well as indigenous communities in the bay started their own small-scale shrimp fishing activities, particularly in the sub-districts of Manimeri (Banjar Ausoy village), Tomu (Taroi village), Aroba (Sidomakmur village), and Babo (Modan village) (Inayah and Darmono, 2017; Irwanto *et al.*, 2017).

These fishers tend to use trammel nets and fish in the estuarine and coastal waters no more than two nautical miles from the shore, traveling in long wooden boats (*kapal jolor*) of less than 10 GT. Key shrimp species targeted are the banana shrimp (*Penaeus merguensis*), endeavor shrimp (*Metapenaeus ensis*), and giant tiger prawn (*Penaeus monodon*), and fishers are able to haul up to 21 kg of shrimp per trip per vessel. In 2016, a total of 1,271 tons of shrimp were harvested from the bay, representing 46 percent of the overall capture fisheries of the region. Peak season for the shrimp fishery is between September and November each year (Inayah and Darmono, 2017; Irwanto *et al.*, 2017).

The second-most sought-after commodity in the bay is crabs, particularly the Indo-Pacific swamp crab (*Scylla oceanica*), orange mud crab (*Scylla olivacea*), and purple mud crab (*Scylla tranquebarica*). In 2016, a total of 498 tons of crabs were harvested from the bay, representing approximately 18 percent of all capture fisheries. The crabs are generally caught using bamboo traps (*bubu*) in the estuaries and mangrove rivers of the region. Crab fishing is particularly prevalent within communities in the sub-districts of Bintuni (Nelayan village), Manimeri, Aroba (Wimro village), and Babo (Modan village and Nuse village). Peak season for the crab fishery is between April and May and again in September each year (Inayah and Darmono, 2017; Irwanto *et al.*, 2017).

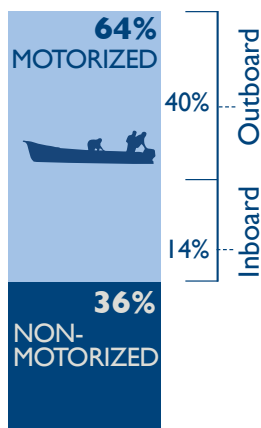
The rest of the fishery is generally comprised of demersal and small pelagic species, particularly barramundi (*Lates calcarifer*), blackspotted croaker

CATCH COMPOSITION IN BINTUNI BAY

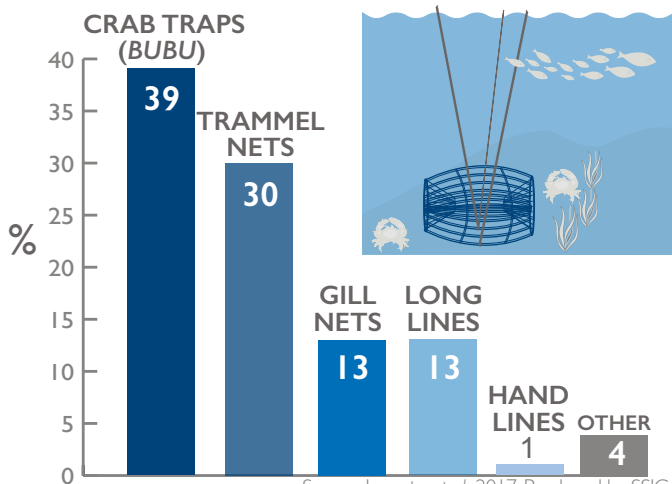


* This family can include both pelagic and demersal species; however, catch of *Carangidae* at Bintuni Bay is dominated by pelagic variants of this family.

BINTUNI BAY FISHING FLEET



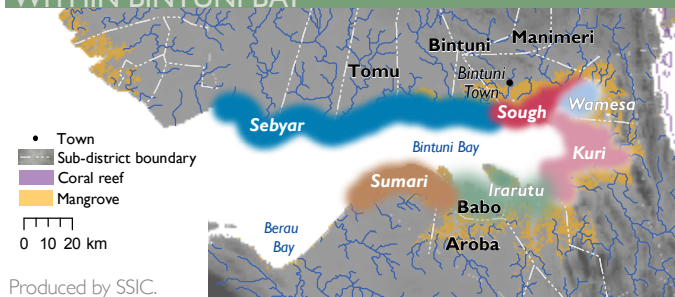
GEAR TYPES IN BINTUNI BAY



Source: Irwanto et al., 2017. Produced by SSIC.

(*Protonibea diacanthus*), Indian mackerel (*Rastrelliger kana-gurta*), narrow-barred Spanish mackerel (*Scomberomorus commerson*), and rays (*Dasyatis kuhlii* and *Rhinobatos* sp.). A range of fishing gears are used for these different targets, including gill nets, long lines, and hand lines (Inayah and Darmono, 2017; Irwanto et al., 2017).

CUSTOMARY MARINE TENURE WITHIN BINTUNI BAY



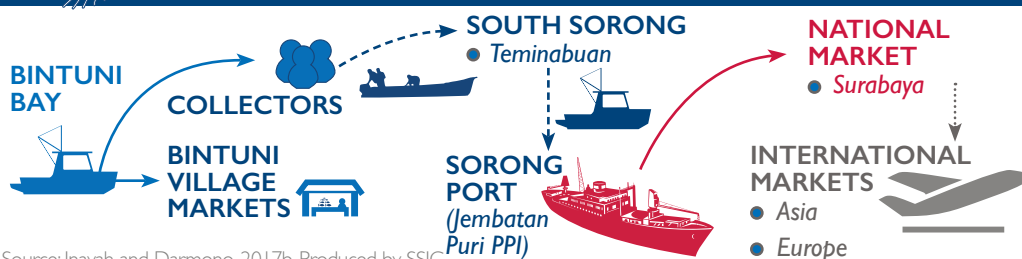
In addition to this, fishers from outside the region often come into Bintuni Bay between September and March each year to harvest Indian mackerel during this species peak season. These fishers often use purse seines, and for the remainder of the year, they work in the flying fish egg fishery in neighboring Fakfak district. Many resident Bintuni Bay fishers also go to join this Fakfak fishery when the local mackerel fishery is depleted (Daniel et al., 2017; Inayah and Darmono, 2017).

Access to fishing grounds within the bay is regulated informally through customary marine tenure arrangements (*hak ulayat adat*), whereby fishers from one community (tribal region) entering another tribe's fishing grounds are required to pay a tariff. One-time fees are usually charged for a period of 15 days per vessel; larger annual payments are levied for open access. The same fees apply to outsider fishers as well as migrant fishers who have moved to the area. There are five recognized tribes with *hak ulayat adat* arrangements situated around the bay.

Fishery infrastructure throughout the region is very limited. While a fish landing station is available in East Bintuni town (with an ice factory, storage facilities, harbor pond, and auction house), the site is in a state of disrepair and generally not used by fishers. Home-based ice production and cold-storage facilities are also extremely limited, as only some areas of Manimeri (Banjar Ausoy Village) and Babo sub-district have electricity 24 hours/day. Other sub-districts generally rely on community generators that are operational only overnight. Therefore, materials and facilities for storing fishery products are almost entirely absent in the local communities, making quick sales to collectors or consumers essential (Irwanto et al., 2017).



SHRIMP SUPPLY CHAIN BINTUNI BAY



Source: Inayah and Darmono, 2017b. Produced by SSIC.

In addition to this, the region is remote and, in some areas, only accessible by sea, limiting the transportation options available to fishers. In Tomu and Aroba sub-districts, boats are the only forms of transport, walking being the only other option. In other communities, basic road infrastructure exists and motorbikes are the most common form of transport. However, the surrounding undulating terrain, particularly between Bintuni Bay and the major fishery market hubs of Sorong and Manokwari, make road transport slow-going, and in some seasons impossible. Therefore, the vast majority of fishery products destined for onward sale leave Bintuni by sea (Inayah and Darmono, 2017; Irwanto *et al.*, 2017).



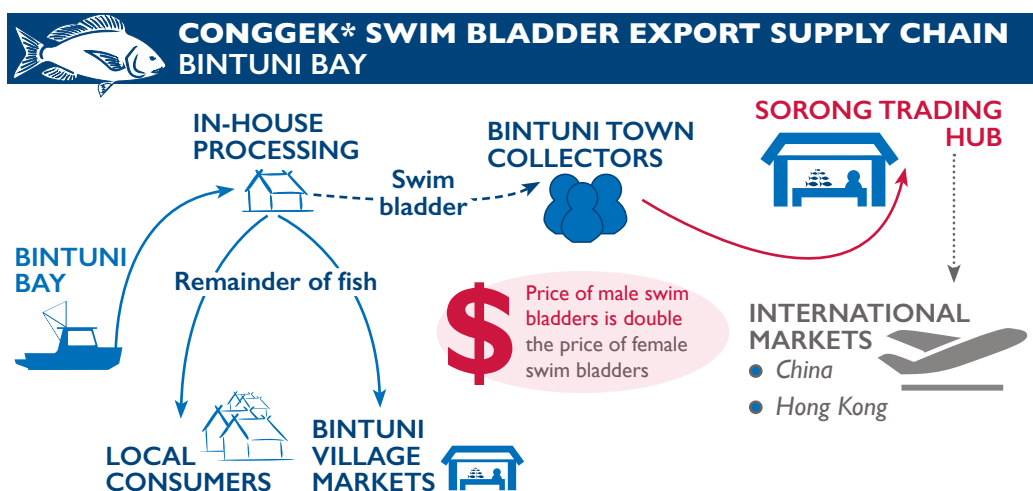
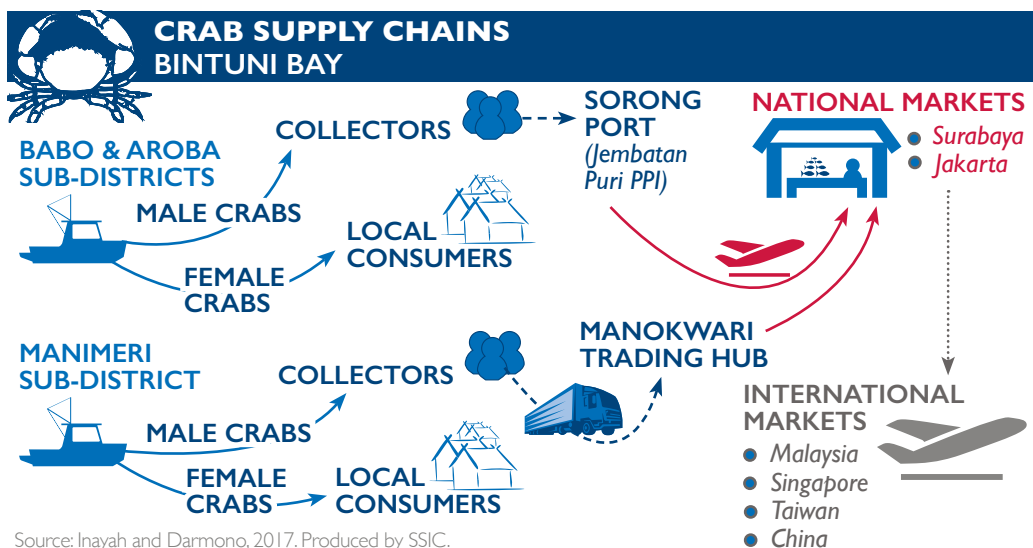
WWF / IRWANTO

Above: crab fisherman in Bintuni Bay, West Papua

Shrimp fishers generally sell their catch to local collectors waiting at various village landing sites throughout the bay. Here the shrimp are sorted into those still with heads and those that have lost their heads through the catch process (as fishers generally receive a price that is around 25 percent higher for shrimp with heads). The shrimp are then packed in ice in polystyrene containers and taken to Teminabuan (on the coast of South Sorong) via boat, where they are then transferred by road to Jembatan Puri PPI in Sorong. Here the shrimp are packed and shipped to Surabaya, from where they are then generally exported to Asia and Europe. At least five shrimp collection companies actively source their products from Bintuni Bay (Inayah and Darmono, 2017).

Crab harvests are sold through several chains. Low quality and female crabs are sold directly to local village markets and consumers. Male crabs are usually sold to local collectors, who first separate them into weight categories. Prices received by the fishers are dependent on the weight of each crab, with fishers earning on average 75 percent more for each crab over 5 ounces in weight (approximately 142 grams) compared to crabs less than 2 ounces (approximately 57 grams) (Inayah and Darmono, 2017).

Crabs collected in the Babo and Aroba sub-districts are then transported by sea to Jembatan Puri PPI in Sorong (approximately a 16-hour journey), where they are packed and then transported



* Conggek refers to two species of demersal fish: Barramundi (*Lates calcarifer*) and blackspotted croaker (*Protonibea diacanthus*). Source: Inayah and Darmono, 2017. Produced by SSIC.

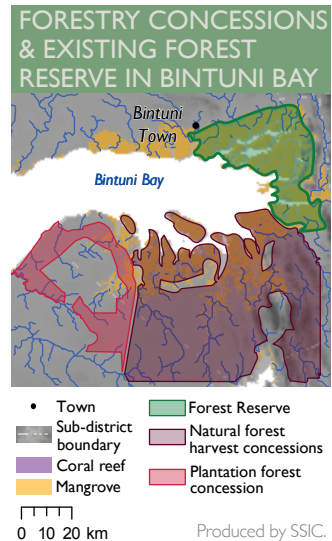
by plane to Jakarta and Surabaya. Crabs collected in the Manimeri sub-district are transported overland to Manokwari, where they too are then packed and transported by plane to Jakarta and Surabaya. From Jakarta and Surabaya, most of the crabs are sold on for export to Malaysia, Singapore, Taiwan, and China (Inayah and Darmono, 2017).

The remaining fishery harvests are generally utilized for local consumption and local sale, with the exception of demersal fish locally known as *conggek*. This is actually two species, barramundi (*Lates calcarifer*) and blackspotted croaker (*Protonibea diacanthus*), whose swim bladders are a highly-prized commodity for export. They are used in Chinese cooking (to make a traditional soup dish considered to improve health) and for industrial use (in the production of gelatin, glue, inks, and surgical sutures) (Tuuli, 2010).

When these species are harvested, their swim bladders are removed and sold to two local collectors in Bintuni town. Male swim bladders command twice the price of female swim bladders. From here, they are transported to Sorong and then exported to China and Hong Kong. The remainder of the fish is used locally in Bintuni, for consumption or local market sale (Inayah and Darmono, 2017).



WWF / IRWANTO



The mangroves themselves are also targets for extraction in the bay, and three timber companies have been given permits to harvest large portions of natural forest (including mangroves), with the concession areas covering the southern side of the bay. The total area for permitted natural forest extraction covers 152,650 ha, with an additional 100,960 ha granted license to establish industrial plantations (Daniel *et al.*, 2017).

In addition to this, the bay has rich fossil fuel deposits that are currently being exploited by both British and Malaysian oil and gas companies. The infrastructure required for mining includes offshore platforms, pipelines, restricted ports, and coastal processing facilities to turn the mined gas deposits into liquified natural gas (LNG) for transportation. Through concession fees and associated taxes, these facilities are expected to contribute approximately 3.6 million USD to the West Papuan provincial government, and 8.7 million USD to the Indonesian central government by 2029 (Daniel *et al.*, 2017). Such lucrative arrangements are enticing, and processes are underway to make the bay a special economic zone (*Kawasan Ekonomi Khusus – KEK*) for oil, gas, and forest exploitation. An investment-coordinating board is being established to encourage further mining activities, and investment into petrochemical processing and smelter plants in the bay is being promoted (Irwanto, 2017).

These activities threaten the ecological integrity of the area and associated livelihoods of local communities, and there have already been several conflicts between exploitative business operations and local fishers. Shrimp and barramundi fishers feel industrial ships traversing their fishing grounds are disrupting harvests and suggest seismic testing in the region is disrupting the productivity of the fisheries, while the companies complain of local fishing activities obstructing their business operations. There are plans to expand mining operations, which is expected to block one of the key fishing grounds of Taroy village fishers (in Tomu sub-district), and the extraction of mangroves at an industrial scale will destroy key habitat for fishery target species and diminish crab, shrimp, and demersal fish stocks (Irwanto, 2017).

These challenges are compounded by an increasing fisher population, with migrant fishers and outsider vessels increasingly operational in the bay. These fishers bring new technologies and techniques. Sulawesi fishers targeting barramundi use gill nets for their activities, whereas local fishers use more environmentally friendly long line techniques; locally made circular crab traps (known as *bubu wadong*) are being usurped by foldable traps (*bubu lipat*) (Inayah and Darmono, 2017).

Above, left: offshore natural gas exploration platform, Bintuni Bay
Right: Bintuni Bay mangrove survey



Add to this the increasing amounts of pollutant waste entering the bay from both industry and household garbage from growing coastal populations, and it is easy to see how a once thriving ecological system risks becoming water-filled wasteland, with potentially devastating socioeconomic consequences locally (Irwanto, 2017). Surveys conducted in 2017 revealed that 57 percent of fishers felt their harvests were already diminishing (Inayah and Darmono, 2017).

Therefore, there has never been a more urgent time to address these challenges if the bay is to be developed sustainably, for the mutual benefit of both the local communities and wider development interests.

SAFEGUARDING BINTUNI BAY

Efforts to sustainably manage Bintuni Bay began in the late 1990s with the establishment of a forest nature reserve (*Kawasan Cagar Alam Teluk Bintuni*) covering 124,850 ha (Gandhi *et al.*, 2008). Approximately 90 percent of this reserve is mangrove forest (Ministry of Forestry decree no.891/KPTS-11/1999). Having this protected area in place has successfully limited the extent of mangrove utilization permits issued for the area (with concession areas abruptly stopping at the border of the reserve). This emphasizes the positive impact that reserve status can have in legally protecting critical habitats. Nonetheless, the on-ground management of the reserve is limited, with non-permitted extraction and utilization occurring throughout.

Therefore, to complement this existing site and strengthen protection of the area, an MPA has been proposed for the bay (Prasetyo *et al.*, 2017), and the West Papua marine spatial plan is in the process of allocating up to 203,136 ha as potential coverage area.

¹ Mangrove species of Bintuni: *Rhizophora mucronata*, *Rhizophora stylosa*, *Rhizophora apiculata*, *Sonneratia alba*, *Bruguiera gymnorhiza*, *Bruguiera sexangula*, *Ceriops tagal*, *Avicennia eucalyptifolia*, *Avicennia lanata*, *Xylocarpus moluccensis*, *Nypa fruticans*, *Heritiera littoralis*, *Acrostichum aureum*, *Xylocarpus granatum*, *Bruguiera parviflora*, *Ceriops decandra*, *Avicennia marina*, *Aegiceras corniculatum*, *Acrostichum aureum*, *Acanthus ilicifolius*, and *Avicennia alba*.

² Mangrove-associated species: *Dolichandrone spathacea*, *Casuarina equisetifolia*, *Terminalia catappa*, and *Derris trifoliata*.

³ Density categorizations determined using normalized difference vegetation index (NDVI) spectral analysis on geospatial data available from the region.

New MPA

Working name
BINTUNI BAY MPA

Proposed size ⁽¹⁾ up to
203,136 ha

Av. mangrove density ⁽²⁾
944 ind/ha

sub-districts **10**

Fisher households ⁽³⁾
1,200

Key protected species

Turtles **Dolphins**

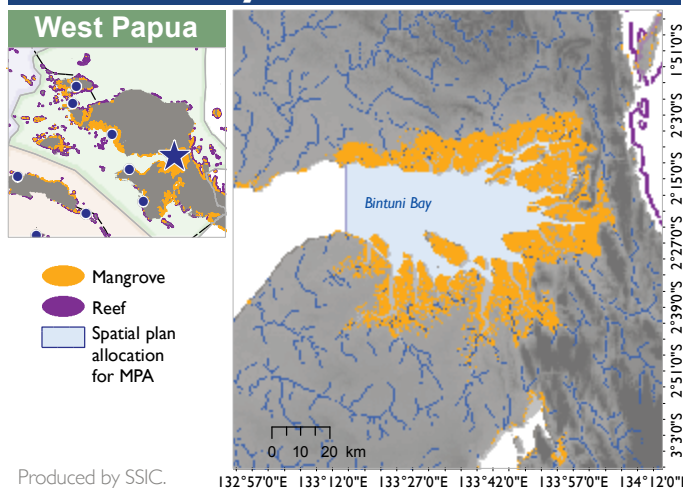
Sharks **Rays**

¹ Allocation provided in the West Papua marine spatial plan (in development).

² Estimate based on extrapolated data from five assessment sites in the bay; ranging from lowest density 520 ind/ha to highest 1,440 ind/ha (Masran *et al.*, 2017).

³ BPS Kabupaten Teluk Bintuni, 2017.

Bintuni Bay MPA



Current management effectiveness ranking: 0



The Bintuni MPA will be designed to improve spatial designation for different resource users, to protect the interests of both local fishers and businesses operating in the region. Zoning will reflect customary marine tenure areas (*hak ulayat adat*) and will be developed with the aim to find compromises between different user groups in order to promote sustainable marine resource management.

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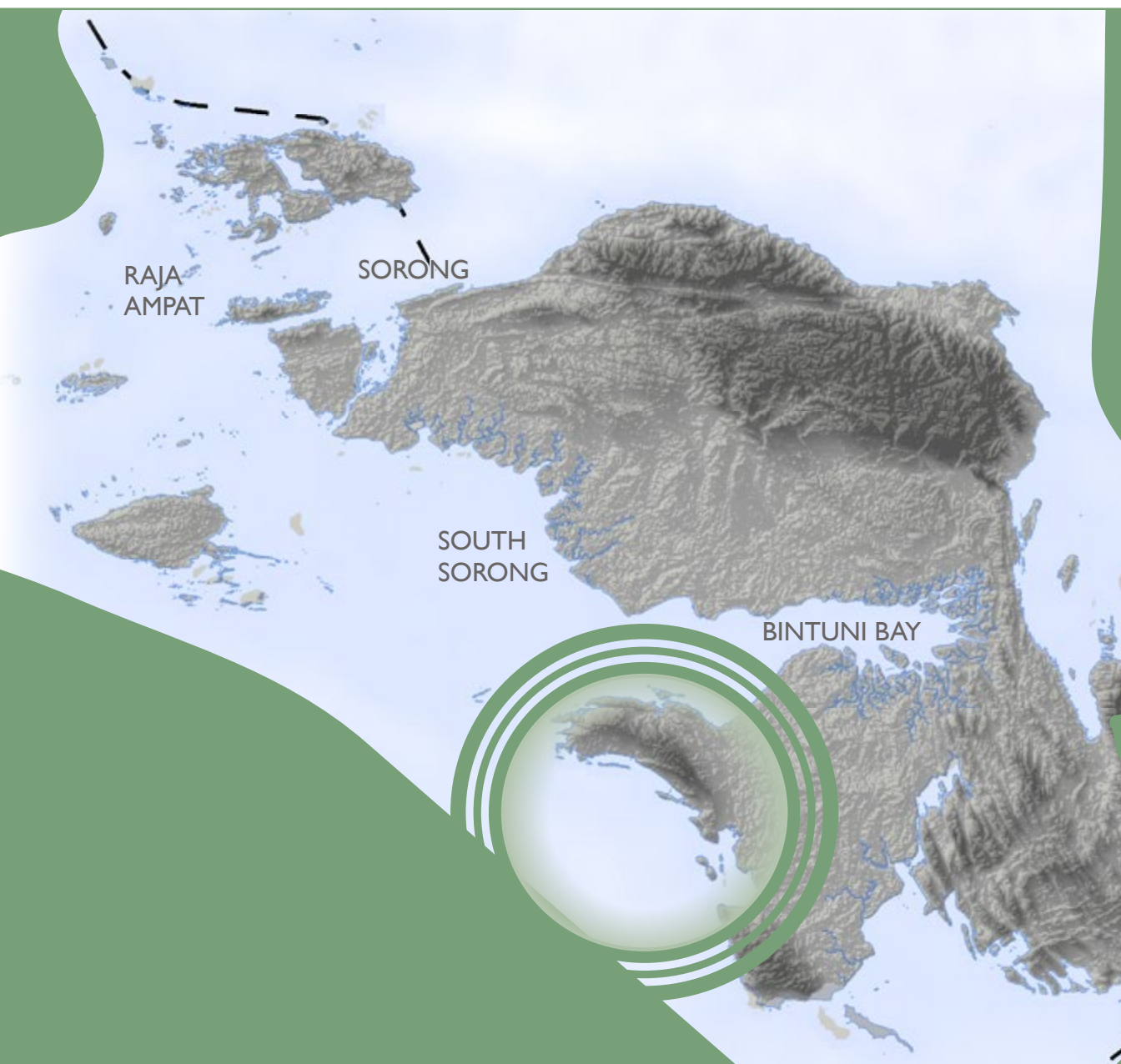


SUMMARY USAID SEA PROJECT SUPPORT

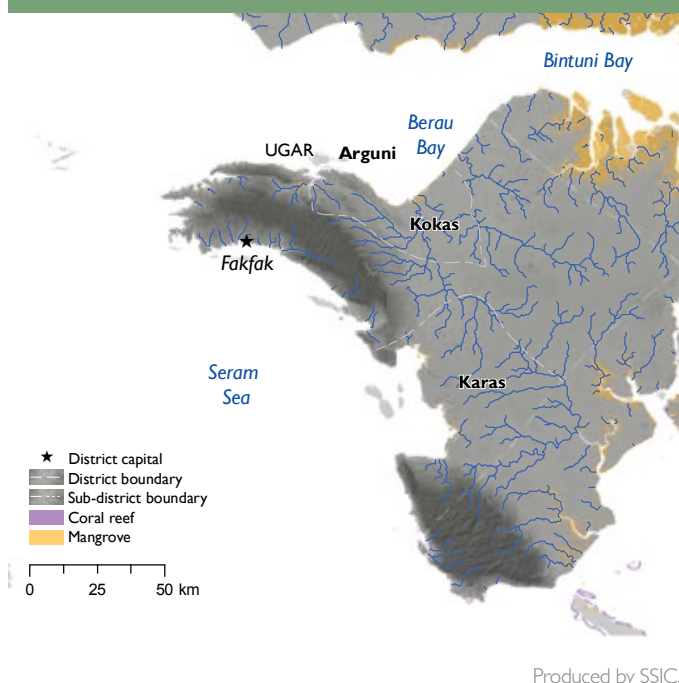
SUPPORT TO MPA ESTABLISHMENT

STEPS TO EFFECTIVE MPA MANAGEMENT SUPPORT (2016-2021)															
Level 1			Level 2			Level 3			Level 4			Level 5			
MPA proposed	Inventory & area ID	Reservation of area	Management unit & personnel	Management & zoning plans	Facilities & infrastructure	Management funding	Plans approved	Management (SOPs)	Plans implementation	Designation (legal) of MPA	Boundary marking	Institutionalization	Resource management	Socioeconomics supported	Community welfare improved
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					

FAKFAK



FAKFAK



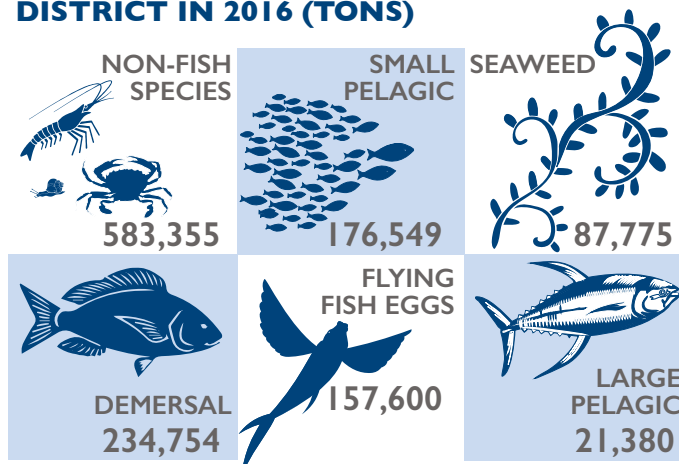
The regency of Fakfak covers a total area of more than 14,000 km² and comprises part of the main landmass of West Papua as well as 503 small islands off shore (Hidayat *et al.*, 2018). The mainland has a hilly and forested topography and is renowned for having some of the largest nutmeg plantations in Indonesia (Pakiding *et al.*, 2018).

The regency is divided into 17 sub-districts. The southwestern coastal areas are host to rich coral ecosystems, with abundant manta ray populations, feeding grounds for green and olive ridley turtles, and resting sites for whale sharks (Hidayat *et al.*, 2018; Tighe, 2017). The region is also renowned for its high

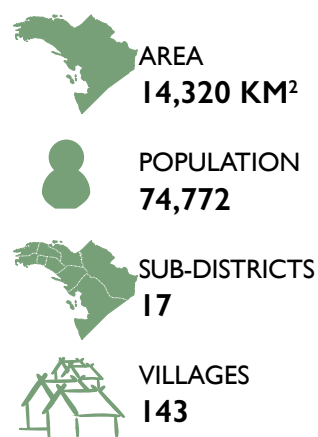
number of endemic marine species, including the triton epaulette shark (*Hemiscyllium henryi*), deep reef scorpionfish (*Scorpaenodes bathycolus*), Jamal's dottyback (*Manonichthys jamali*), Giti damselfish (*Chrysiptera giti*), Fakfak damselfish (*Pomacentrus fakfakensis*), and Nursalim flasher wrasse (*Paracheilinus nursalim*).

The coastline of Fakfak stretches for 1,267 km, with an estimated 443,900 ha of nearshore waters regularly utilized for fishing (Hidayat *et al.*, 2018). Within the region, the sub-districts of Karas, Kokas, and Arguni are particularly renowned for their marine biodiversity and significance for local fishery livelihoods. MPAs have recently been established at these sites through the support of the USAID SEA Project in recognition of their importance. These are the Berau Bay MPA (in Kokas and Arguni) and the Nusalasi MPA (in Karas).

TOP MARINE PRODUCTS FROM FAKFAK DISTRICT IN 2016 (TONS)



Source: BPS Kabupaten Fakfak, 2017. Produced by SSIC.

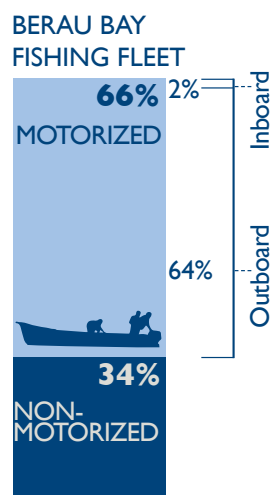


Source: BPS Kabupaten Fakfak, 2017

THE RESILIENT REFUGE OF BERAU BAY

Located in the Kokas-Arguni region, the Berau Bay is home to 19 villages. Key livelihoods in the area include farming (involving approximately 23 percent of the working population), particularly for cloves, nutmegs, coconuts, and cocoa as well as fishing (approximately 10 percent), with 463 recorded fishers in the area (2012 data) operating with 323 fishing vessels (2013 data) (BPS Kabupaten Fakfak, 2017; Pakiding *et al.*, 2018).

Surveys conducted in 2018 revealed that key fishery targets are pelagic species, such as trevally (*Carangidae sp.*), Indian mackerel (*Rastrelliger kanagurta*), and skipjack tuna (*Katsuwonus pelamis*), as well as demersal species, such as snappers (*Lutjanidae sp.*) and groupers (*Epinephelidae sp.*). Non-fish products are also gleaned from these waters, particularly lobsters, sea cucumbers, and trochus shells. Catches are predominantly used for local subsistence and to supply the nearby gas and oil company personnel in nearby Bintuni Bay (Hidayat *et al.*, 2018; Pakiding *et al.*, 2018).



CI / M A ERDMANN



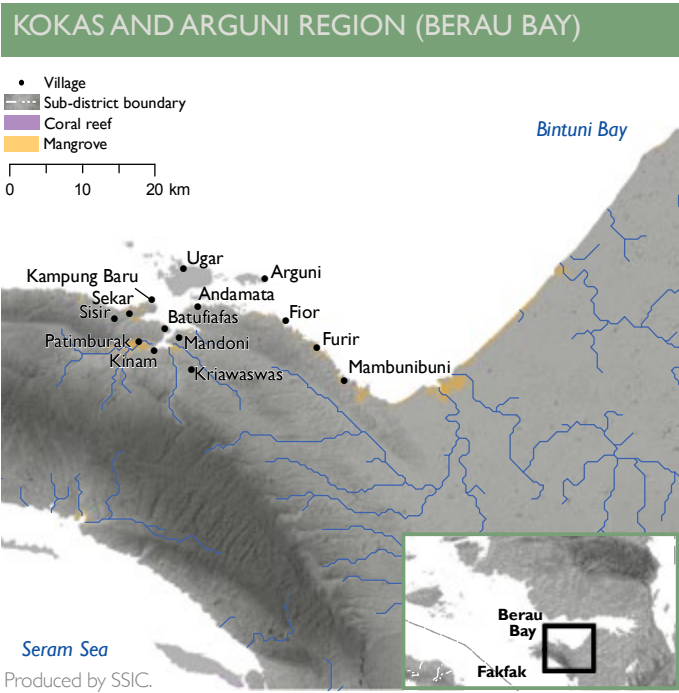
Trade beyond these local sales is limited by the infrastructure present in the region. Electricity for home-based cold storage facilities (refrigerators) is only available in four of the communities (Kampung Baru, Arguni, Sisir, and Sekar), while the rest rely on generators and low voltage solar cells for power. In addition to this, road infrastructure to support transportation is limited in many areas, with island-based communities and villages in remote areas relying on boat transportation only. This too is challenging for many, as only one boat repair center is available in the region (in Furir village) (Pakiding *et al.*, 2018).

The most common fishing gear used is hand lines (82 percent of fishers), with some fishers (particularly in the communities of Kampung Baru, Patimburak, Sekar, and Sisir) solely using this gear. In other villages, fishers also use gill nets and long lines (Pakiding *et al.*, 2018). Across the region, an average of 11 percent of households are members of some form of fisher cooperative, with the highest membership levels found in Furir village (50 percent) (Pakiding *et al.*, 2018).

In addition to capture fisheries, seaweed cultivation has been a key livelihood in this region for many years, but has declined in recent times due to failing harvests. Suspected causes for these failed harvests are higher rainfalls, and the associated changes to water quality caused by a greater inundation of freshwater, the associated sediment load from deforestation, and changing land-uses through the numerous estuaries and river outlets in the region (Hidayat *et al.*, 2018).

Compounding the challenges experienced by these failed seaweed harvests, marine resource users are also noting an increase in outsider fishers entering the area, increasing fishing pressure. Additionally, destructive practices (bomb and poison fishing) have been observed, and fishers have perceived a decline in fish stock, prompting desire from community members to explore sustainable management actions (Hidayat *et al.*, 2018; Tighe, 2017).

This led to a joint community declaration in November 2016 aiming to establish the Berau Bay MPA as a ‘coastal park’ (*taman pesisir*). This declaration was then formalized through a governor’s decree in July 2017¹.



Far left: Kokas-Ogar Strait
Below: trochus shells are a target species gleaned in Berau Bay



¹ This joint community declaration supported the establishment of both the Berau Bay MPA and the Nusalasi MPA.

Legal name
Kawasan Konservasi
Perairan Daerah Taman
Pesisir Teluk Berau

Year est.
2017

Decree and status
Governor's decree no.
523/136/7/2017
(25 July 2017)


Management plan? ✖

Zoning plan? ✖

Size
99,000 ha


Area of NTZ coverage
None yet

Av. hard coral cover ⁽¹⁾




43%

Av. fish abundance ⁽²⁾



3,970
ind/ha


Av. fish biomass ⁽²⁾



873
kg/ha


villages in MPA 19

Population ⁽³⁾




3,481

Key protected species



Turtles



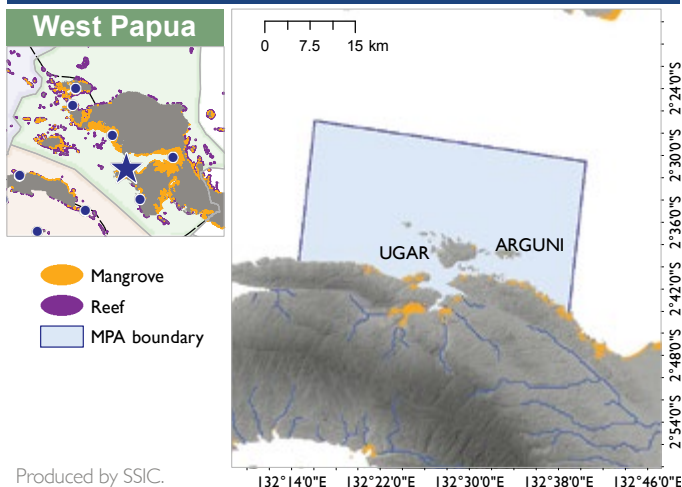
Manta
rays

¹ PIT surveys. 50m (0.5m intervals).
n = 14 sites. Shallow depth (~3m)
(Hidayat et al., 2018).

² Based on UVC belt transects (50m
x 5 replicates), plus timed swims
(400m). Recorded at only 5m depth
due to limited visibility (Hidayat et
al., 2018).

³ Data from 14 sampled villages (no
data from 5 remaining villages)
(Pakiding et al., 2018).

Berau BAY MPA



Current management effectiveness ranking: 0



The community agreement that laid the foundation for the MPA explicitly prohibits community members from using destructive and illegal fishing gears and promotes collaborative community co-management of the area. The USAID SEA Project and partners provided initial training, awareness raising, and support to local stakeholders throughout the MPA establishment process; support included extensive consultation sessions and participatory mapping exercises to support preliminary MPA design (Hidayat et al., 2018; Nikijuluw et al., 2018b).

Additional support included biophysical surveys undertaken in 2018, which underscored the conservation importance of the region. The coral reefs were found to be particularly resilient to a wide range of stressors, including high sediment load, high temperatures, and low salinity due to the considerable freshwater intrusion from neighboring Bintuni Bay area. Such levels of resilience suggest the site may act as an important future reservoir of resilient coral genotypes able to flourish under stress. This is particularly important in an age where climate change is threatening reefs globally (Allen and Erdmann, 2018; Hidayat et al., 2018). In addition to this, in some areas of the MPA, hard coral cover was found to exceed other areas of the Bird's Head Seascape, making this region critical for marine habitat and biodiversity conservation.

During these surveys, a total of 257 reef fish species were also identified (Nikijuluw et al., 2018a); seven of these are thought to be potentially new to science (Allen and Erdmann, 2018). These include a new species of pipefish (*Choeroichthys* sp.), damselfish (*Pomacentrus* sp.), and shrimp goby (*Amblyeleotris* sp.). Work on determining their taxonomic status continues into the present.

Combining the results of surveys and community consultations to date has resulted in the preliminary identification of at least 10,000 ha of potential no-take zones to be established within the

TOURISM IN FAKFAK

The beautiful scenery of Fakfak has increasingly attracted attention in recent years as an unspoiled and enticing destination. However, tourism remains relatively small scale, with the majority of international visitors arriving by liveaboard and not venturing to land. In 2014, only 214 foreign visitors were recorded as entering the regency (predominantly British and American tourists) (BPS Kabupaten Fakfak, 2017).

To date, infrastructure for tourism remains extremely limited, with only 12 accommodation establishments (mostly low-end) existing in the region (BPS Kabupaten Fakfak, 2017). Electricity and water supplies are limited in some areas and many sites are as yet inaccessible by road. Due to its intriguing remoteness, the region is appealing to the more intrepid traveler, but there are also challenges when it comes to meeting visitors' needs (Hidayat *et al.*, 2018; Pakiding *et al.*, 2018).

Nonetheless, considerable opportunities exist for capitalizing on the rich resources of the area. Along the coast, visitors can snorkel around exquisite coral gardens, dive WWII wrecks, or simply luxuriate on the picture-perfect beaches of Patawana or Pasir Putih. On land, visitors can explore the caves of Kokas and relax by the waterfalls of Kitikiti, Fatar, and Baradawan (Mourly, 2016). For those interested in history, there are prehistoric Tapurarang stone artworks on the hillside of Andamata village and a 200-year-old mosque in Patimburak village (Dwi, 2014; Mourly, 2016).

MPA as a key next step for MPA management planning. A task force (*kelompok kerja / pokja*) has been established involving representatives of key stakeholder groups to oversee the planning process. Zoning development is expected to incorporate and revitalize the traditional management system of *sasi* (locally known as *kerakera*) that used to be implemented in several communities through the region but survives today only in Ugar village. This will be complemented by the identification and zoning of traditional fishing and utilization areas and the establishment of a collaborative MPA management unit.

Right: Berau Bay provides critical habitat for many reef species, including this pipefish



CI/HA ERDMANN



DEPOSITPHOTOS.COM

THE UNPARALLELED DIVERSITY OF NUSALASI

Located on the southwest coast of Fakfak, in Karas sub-district, this region is home to seven villages. Key livelihoods in the area include farming (involving approximately 43 percent of the working population), particularly for nutmegs and coconuts, and fishing (approximately 12 percent), with 506 recorded fishers in the area (2012 data) operating with 282 fishing vessels (2013 data) (BPS Kabupaten Fakfak, 2017; Pakiding *et al.*, 2018).

Surveys conducted in 2018 revealed that key fishery targets are groupers (*Epinephelidae sp.*), with many sales involving live grouper to company grow-out cages located in the region. Mixed reef fish catches are utilized for local consumption and a number of bait fishing platforms (forms of FADs) exist in the region for harvesting anchovies. These catches are generally sold to fishers targeting large pelagic species, or dried and sold locally for consumption (Hidayat *et al.*, 2018; Pakiding *et al.*, 2018). Many of the villages rely on generators and low voltage solar panels for electricity, making refrigeration of catches and wider trading challenging (Pakiding *et al.*, 2018). The region is also adjacent to a rapidly expanding fishery for flying fish eggs (see page 190).

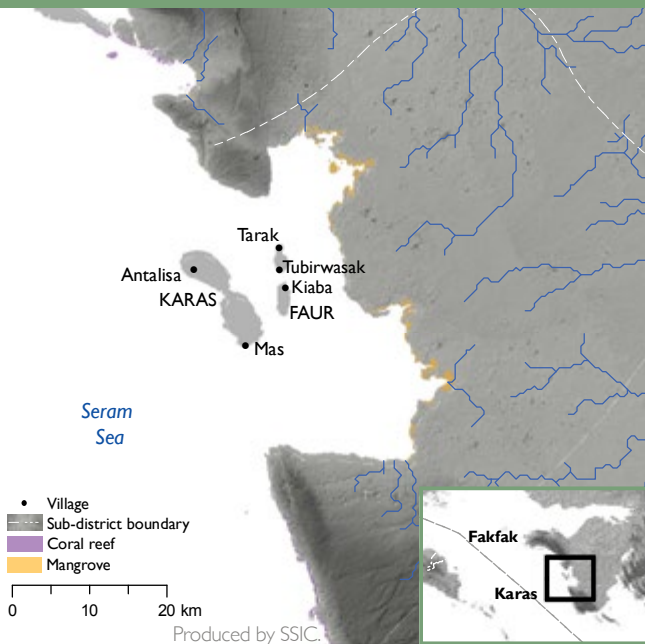
The most common fishing gear used is hand lines (82 percent of fishers), with some fishers (particularly in the communities of Antalisa and Kiaba) solely using this gear. In other villages fishers also use gill nets (Pakiding *et al.*, 2018). Across the region, an average of 27 percent of households are members of some form of fisher cooperative, with the highest membership levels found in Antalisa village (40 percent) (Pakiding *et al.*, 2018).

Similar to Berau Bay, threats encountered in the area are destructive fishing practices (bomb and poison fishing), the use of FADs, and the region's status as supplier of live reef fish for grow-out cages. These pose challenges to the sustainability of the region's fishery (Hidayat *et al.*, 2018; Tighe, 2017). Therefore, the community declaration made jointly with Berau Bay community members in November 2016 included a commitment to establish the Nusalasi MPA, covering an area of 251,000 ha. This commitment was then formalized through a governor's decree in July 2017.

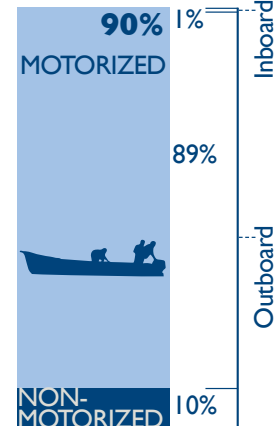


WWF / A BAKARBESSY

KARAS REGION (NUSALASI)



NUSALASI FISHING FLEET



Above, left: groupers are a key fishery target in Nusalasi region

Above: fishing platform

Below: drying fish for local consumption

WWF / SASI



Legal name
Kawasan Konservasi
Perairan Daerah Taman
Pesisir Nusalasi
Van Den Bosch

Year est.
2017

Decree and status
Governor's decree no.
523/136/7/2017
(25 July 2017)


Management plan? ✗

Zoning plan? ✗


Size
251,000 ha

Area of NTZ coverage
None yet

Av. hard coral cover ⁽¹⁾




S = 40%




D = 38%

Av. fish abundance ⁽²⁾



**8,299
ind/ha**

Av. fish biomass ⁽²⁾




**2,174
kg/ha**


villages in MPA
7

Population ⁽³⁾
2,687

Key protected species

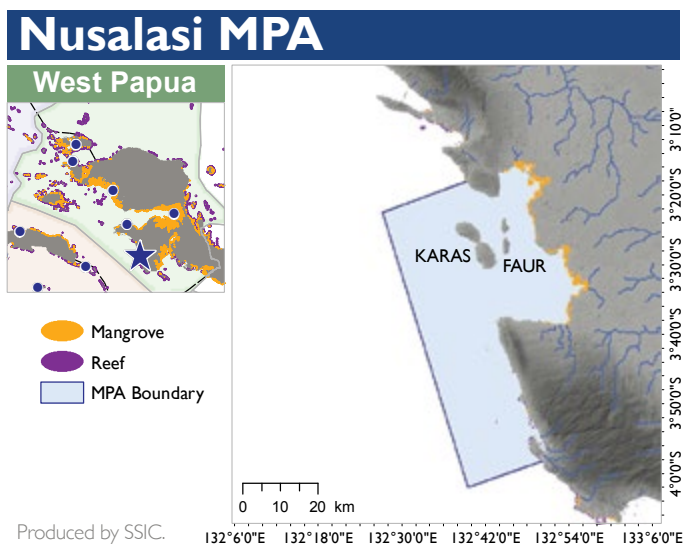


Turtles



**Manta
rays**

¹ PIT surveys. 50m (0.5m intervals). S = shallow (<4m), D = deep (10m); n = 17 sites (Hidayat et al., 2018).
² Based on UVC belt transects (50m x 5 replicates), plus timed swims (~ 400m). Recorded at 10m depth (Hidayat et al., 2018).
³ Pakiding et al., 2018.



Current management effectiveness ranking: 0




Under the same declaration as the Berau Bay MPA, the agreement to establish this site explicitly prohibits community members from using destructive and illegal fishing gears and promotes collaborative community co-management of the area. Through replicate training, awareness raising, community consultations, and participatory mapping processes, preliminary MPA design is now underway (Hidayat et al., 2018; Nikijuluw et al., 2018b).

Biophysical surveys undertaken in the region in 2018 revealed a wide range of reef habitats, from sheltered coastal reefs to exposed offshore reefs lying adjacent to deep water, supporting an exceptionally rich and varied fish community. Surveyors encountered an average of 254 different species per sample site (and more than 200 at each site), suggesting tremendous levels of fish diversity in the area. Overall, a total of 531 reef fish species were identified (Nikijuluw et al., 2018a), and a potentially new species of coral dwarf-goby (*Eviota* sp.) was observed at one site but has yet to be verified (Allen and Erdmann, 2018).

Combining the results of surveys and community consultations has resulted in the preliminary identification of at least 60,000 ha of potential no-take zones to be established within this coastal park (*taman pesisir*) as a key next step for MPA management planning. Like Berau Bay, zoning development in Nusalasi will also incorporate and revitalize the traditional management system of *sasi* (*kerakera* locally) that is still implemented in at least three communities within the MPA (Antalisa, Kiaba, and Tubirwasak) (Pakiding et al., 2018). This will be complemented by the identification and zoning of traditional fishing and utilization areas and the establishment of a collaborative MPA management unit.

SUMMARY USAID SEA PROJECT SUPPORT

STEPS TO EFFECTIVE MPA MANAGEMENT SUPPORT (2016-2021)																
Level 1			Level 2			Level 3			Level 4			Level 5				
MPA proposed	Inventory & area ID	Reservation of area	Management unit & personnel	Management & zoning plans	Facilities & infrastructure	Management funding	Plans approved	Management (SOPs)	Plans implementation	Designation (legal) of MPA	Boundary marking	Institutionalization	Resource management	Socioeconomics supported	Community welfare improved	Sustainable funding
✓	✓	✓	✓	✓	✓		✓	✓	✓	✓						
Independent MPA																
Optimally managed MPA																
Minimally managed MPA																
Established MPA																
Initialized MPA																



for a full description of the activities being implemented under each of these steps: see volume two, chapters three and four

In both Berau Bay and Nusalasi MPAs, opportunities to promote marine-based sustainable tourism will be explored, both as a driver for sustainable coastal management and as an alternative or additive livelihood for local community members.

Key behavior changes anticipated through this work:

- Willingness to engage in MPA design and planning
- Willingness to comply with MPA zoning, including local *kerakera* designations and wider no-take zones
- Adoption of sustainable fisheries management practices
- Adoption of sustainable marine tourism best practices for visitor management
- Willingness to comply with marine and coastal regulations

Target audiences: Fishers, community members, government

Key capacity-building support areas provided:

- Resource mapping, management planning, and MPA zoning
- Sustainable fisheries management
- Marine ecology
- Collaborative MPA management
- Sustainable tourism best practices

Target audiences: Fishers, community members, government

Below: hawksbill turtle



THE FLYING FISH OF FAKFAK

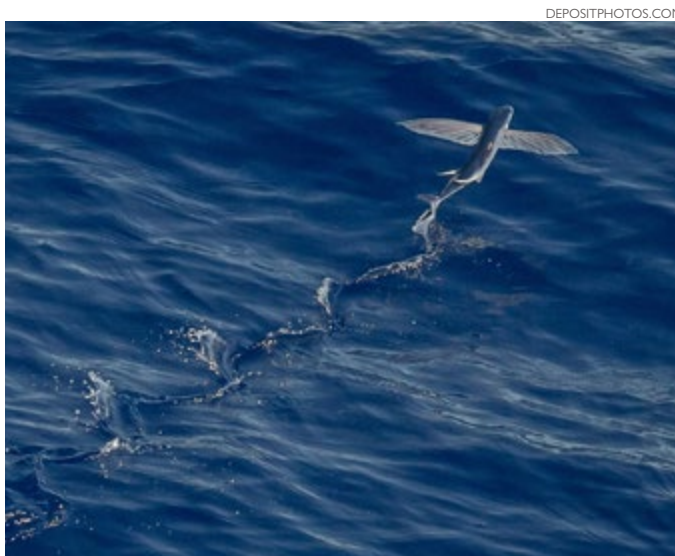
Since the early 2000s, the waters off the coast of Fakfak have become an increasingly important source of flying fish eggs, utilized for both consumption and trade.

Flying fish are remarkable creatures from the *Exocoetidae* family. They have large pectoral fins, which they can spread open to form wings, and are able to launch themselves out of the water and ‘fly’ at almost 65 km/h for distances up to 200 meters (Davenport, 2003; Ichimaru, 2007; Sea Port, 2018). Flight is achieved by tail propulsion: the fish beat their tails between 50 and 70 times per second, aiming to stay within 0.5 m of the sea surface to reduce drag (Davenport, 1994; Sea Port, 2018).

The fish are often caught for direct consumption, but increasingly it is their eggs that are the more highly prized commodities. Known as *tobiko* in the Japanese culinary world, these eggs are traditionally used in sushi and sashimi preparation, used as a colorful garnish and ingredient of various dishes, or sold on their own as *nigiri* (Huang, 2012; Sea Port, 2018). Collection and trade of these eggs from within Indonesia first began in the region of South Sulawesi. According to historic literature, flying fish eggs (roe) were traditionally used in Mandarese dishes in this region for centuries, but with an export market to Japan emerging in the early 1970s, the harvesting of eggs increased dramatically, along with the prices received by the fishers.

In 1971, eggs started to be exported to Japan at the sale price of 1,000 IDR/kg, and by 1975 (only four years later), these eggs had become South Sulawesi’s second-highest export commodity (after shrimp), with prices continuing to soar, reaching 10,000 IDR/kg by 1985 and providing a lucrative livelihood for fishers in the Makassar Strait (Zerner, 1987).

Since that time, the rise in interest for Japanese food globally has grown exponentially, placing even greater demands on this product. By the end of the 20th century, the stocks in the Makassar Strait had begun to reduce dramatically, declining at an estimated rate of 5 tons/yr in the years leading up to the turn of the century (Ali, 2005; Suwarso *et al.*, 2008). This resulted in fishers from the region traveling further afield to source eggs (Ozosawa, 2013; Tuapetel *et al.*, 2017).



Above: sushi with fish eggs

Left: flying fish species *Hirundichthys oxycephalus* provides 80 percent of the eggs harvested in the Fakfak region

HOW TO CATCH AN EGG?

Unlike other types of fish eggs (which are usually harvested by catching the fish and extracting the eggs from the dead females), harvesting flying fish eggs does not actually require catching or killing the fish. Rather, the fishers capitalize on this species' natural reproductive inclinations to lay their eggs on floating structures (such as seaweeds) in the upper water column.

During spawning season, gravid females seek suitable places to deposit their eggs, and the fishers provide this in the form of a so-called *pakkaja*. *Pakkajas* are floating platforms usually made from palm leaves and bamboo lashed together and adorned with enticing seaweeds (Hasriyanti *et al.*, 2016). These are set afloat in the ocean; during spawning periods, the fishers make between three and five trips per season to haul in these platforms and extract the eggs (UNIPA, 2017a).

At times, *pakkajas* are accompanied by a *bale-bale*, a type of fishing trap beneath the platform to also harvest the larger fish as secondary catch (Hasriyanti *et al.*, 2016). In addition to this, many adult females become trapped by the adhesive filament of the eggs they have laid and are hauled in along with the eggs before they can escape (Tuapetel *et al.*, 2017). Therefore, while this form of harvesting offers the potential for keeping capital wild stock intact (as yields can be achieved without removal of the fecund females), this is frequently not the case, and wild stock is removed along with the eggs. In addition to this, large-scale egg extraction can impact the viability of future generations of the species.

By 2001, the Makassar fishers (particularly from Galesong and Takalar) had arrived in Fakfak, West Papua in search of this lucrative commodity (UNIPA, 2017b). Here, these migrant fishers were rewarded with abundant egg harvests, predominantly from the species *Hirundichthys oxycephalus* (the bony flying fish, or *torani*) and *Cypselurus poecilopterus* (the yellow wing flying fish, or *banggung*) (UNIPA, 2017a). By 2002, 170 vessels from Makassar were traversing the waters of the Seram Sea, and in that year alone an estimated 33,472 kg of eggs were harvested (FPIK-UNIPA, 2017).

KEY FLYING FISH EGG HARVESTING LOCATIONS IN INDONESIA



Source: FPIK-UNIPA, 2017. Produced by SSIC.

By 2008, while yields in Makassar had reduced to less than 400 kg/vessel, yields in Fakfak had increased to approximately 1,077 kg/vessel on average (FPIK-UNIPA, 2017). This, combined with increasing prices per kilogram being paid to the fishers, resulted in even more Makassar vessels traveling to the region as well as local fishers joining the fishery. Activity in these waters peaked in 2016, with 443 vessels documented as active¹ (UNIPA, 2017a).

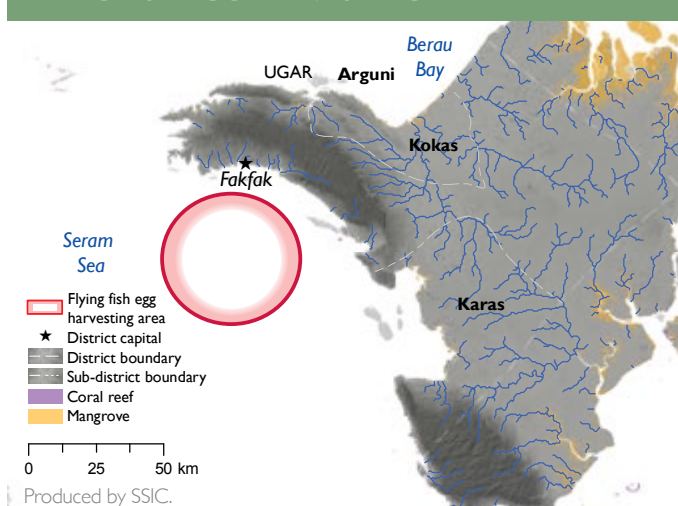
Egg harvests from the region steadily increased up until 2014, when they reached an overall documented high of 334,210 kg². CPUE peaked in 2015, with fishers harvesting on average 11.2 kg of eggs each time they hauled in their *pakkaja* (equaling an average of 1,008 kg per vessel per year) (UNIPA, 2017a).

By this time, the fishery had become well established, with the harvested eggs being issued a certificate of origin (*Surat Keterangan Asal – SKA*) before being dispatched to Makassar for onward sale and export. The trade has also evolved to include financiers providing capital to boat owners (captains) and their crews of between 4 and 6 people, and company entrepreneurs engaged in managing the handling of necessary permits and paperwork, as well as coordinating domestic trade.

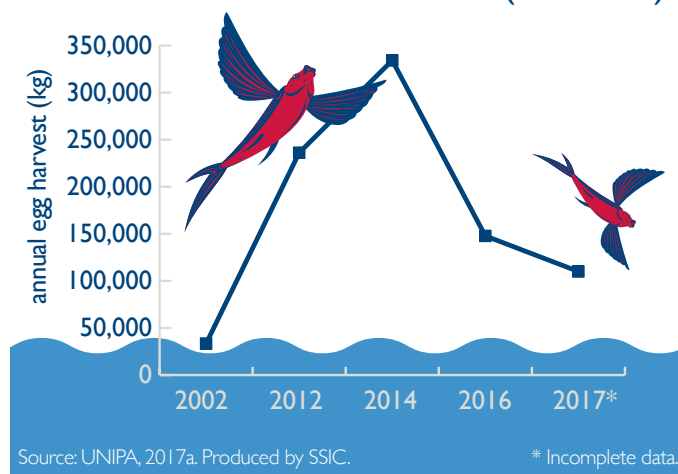
However, in 2016, harvests plummeted, with hauls yielding on average only 3.7 kg (averaging 334 kg/yr/vessel), more than a 300 percent decrease compared to previous harvests (UNIPA, 2017a).

This sharp decrease has been blamed, in part, on adverse weather conditions affecting the spawning patterns of the fish (UNIPA, 2017a). However, the correlation between increased pressure on resources and the decline in harvests is clear, suggesting

FLYING FISH EGG HARVESTING AREA



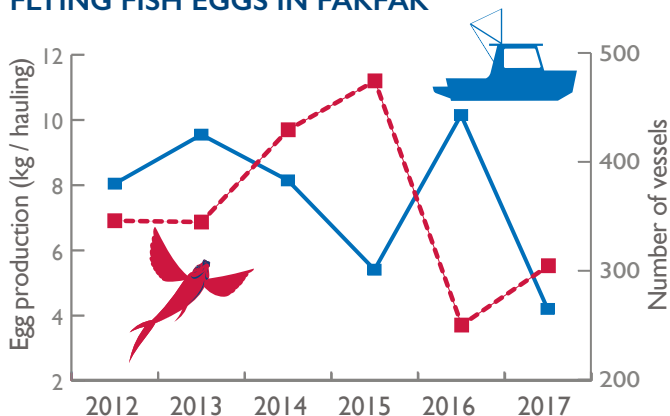
OVERALL FLYING FISH EGG YIELDS IN FAKFAK (KG / YEAR)



this fishery may be experiencing a level of over-exploitation that threatens its future viability.

Therefore, in 2017, efforts got underway to assess the status of the stock and develop associated management mechanisms for the fishery, with support from the USAID SEA Project. Work will continue in the coming years to implement sustainable fisheries management interventions, promote benefit streaming for local communities, and ensure all vessels (local and outsider) are registered so that the fishery can be managed appropriately.

CATCH PER UNIT EFFORT (CPUE): FLYING FISH EGGS IN FAKFAK



Source: UNIPA, 2017a. Produced by SSIC.

SUMMARY USAID SEA PROJECT SUPPORT

UNDERTAKING FISHERY ASSESSMENTS

Undertaking assessments of flying fish stock and fisher harvests in the target location.

STOCK
ASSESS

IMPLEMENTING FISHERY INTERVENTIONS

Contributing to the development of a fishery management plan using EAFM; exploring and promoting sustainable market mechanisms and improving processing in line with national standards, to direct benefits to local communities.

MARKETS

INPUT &
OUTPUT
CONTROL

MONITORING, EVALUATION & MANAGEMENT

Ensuring vessels are registered and fishery activities are appropriately trackable for long-term management purposes.

VESSEL
REG

Key behavior changes anticipated:

- Greater awareness of sustainable fisheries management practices amongst both local communities and migrant fisher populations
- Willingness to comply with registration and engage in monitoring activities
- Willingness to comply with fishery management interventions

Target audiences: Fishers (local and migrant), traders, financiers and community members

Key capacity-building support areas provided:

- Sustainable fishery monitoring and management
- Improved processing and marketing skills (locally)
- Surveilling, monitoring, and enforcing EAFM management

Target audiences: Fishers (local and migrant), traders, financiers, community members and government

for a full description of the activities being implemented under each of these steps: see volume two, chapter four

Far left: flying fish

Over page, left: soft coral withstanding a strong current in eastern Indonesian waters

Over page, right: fishing boat in eastern Indonesia

¹ Data acquired from the operational feasibility letters (Surat Laik Operasi – SLO) issued under PSDKP, Fakfak.

² Data acquired from the quantities registered on the certificates of origin (SKA).





J MORGAN

AFTERWORD

This State of the Sea publication in three volumes has provided an overview of the current status of marine and coastal management in Indonesia. It has taken the reader on a journey exploring the frameworks in place to promote sustainable resource utilization at the national level (in volume one), delving into the technical approaches being implemented to manage critical marine habitats and promote sustainable small-scale fisheries (in volume two), and finally traveling through three provinces in eastern Indonesia where these technical approaches are being trialed and deployed through support from the USAID SEA Project (in volume three).

It is clear that considerable work is underway within the country to address the threats and challenges facing the marine and coastal environment. This publication reflects these efforts at a pivotal moment in Indonesia's evolution as a global maritime leader. It is the authors' hope that this will shine a light on the accomplishments to date and call attention to the enormous hard work required in the coming years to enable the nation to become truly sustainable and prosperous.

**For more information on the developments underway within the
Ministry of Marine Affairs and Fisheries, Republic of Indonesia,
go to: www.kkp.go.id**

**For more information on the USAID SEA Project,
go to: www.sea-indonesia.org**

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GIS / Maps

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Capitals: Capitals and large cities from ESRI Data & Maps 2015.



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